FEB 18 1920

PERIODICAL ROOM
GENERAL LIBRARY
UNIV. OF MICH.

THE INDUSTRIAL-ARTS MAGAZINE

MARCH 1926

THE BRUCE PUBLISHING COMPANY
MILWAUKEE, WISCONSIN

ATKINS

SILVER STEEL SAWS

SAW TOOLS AND SAW SPECIALTIES

No. 400. Ship Point

No. 53. Regular

No. 51. Ship Point

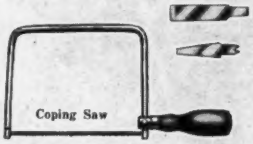
No. 65. Regular

No. 100. Flooring Saw

Plumbers' Saw

Compass Saw

Handy Tools



Coping Saw

AAA Grass Hook

Lever Saw Set

Bit Brace

Modern Methods Make Atkins Saws the Leaders

Atkins Saws stand at the head of the list of high grade tools, not only for quality of materials but for real improvements and patented features possessed by no other make.

Sawing Made Easy

The patented grinding feature of Atkins Silver Steel Saws provides for the cutting edge to be the same thickness throughout, while the back tapers gradually wedge-shape from handle to point. This feature makes sawing easy under all conditions, and at the same time it speeds up production and saves a world of hard work.

Improved Perfection Handle

This patented handle is furnished on Atkins Nos. 53, 65 and 400. Its distinctive features are a big improvement over the old style block handle.

Informative literature will be sent you on request. Enclose 35c for a high grade nail apron; ask for Saw Sense and souvenir.

No. 7. Pruning Saw

No. 11. Pruning Saw

No. 82.

Junior Mechanic

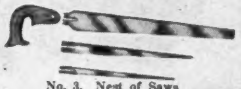
No. 21. Metal Cutting

No. 61. Regular

Carpenters' Handy Saw

Cable Saw

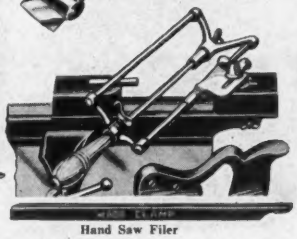
Back Saw



No. 3. Nest of Saws

No. 3. Trowel

Perfection Floor Scraper



Hand Saw Filer

E. C. ATKINS & COMPANY

ESTABLISHED 1857 — THE SILVER STEEL SAW PEOPLE

Machine Knife Factory: Lancaster, N. Y.

Home Office and Factory: Indianapolis, Ind.

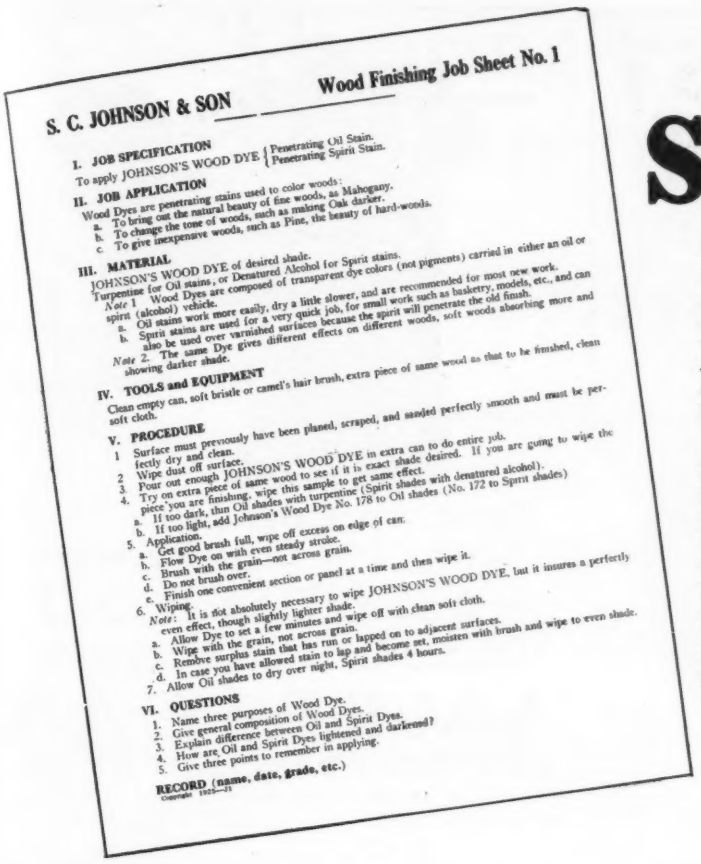
Canadian Factory: Hamilton, Ont.

BRANCH HOUSES

Atlanta — Memphis — New Orleans — San Francisco — Paris, France

Chicago — Minneapolis — New York — Portland — Vancouver, B. C.

THE FINEST ON EARTH



S. C. JOHNSON & SON — Wood Finishing Job Sheet No. 1

I. JOB SPECIFICATION
To apply JOHNSON'S WOOD DYE { Penetrating Oil Stain. / Penetrating Spirit Stain.

II. JOB APPLICATION
Wood Dyes are penetrating stains used to color woods:
a. To bring out the natural beauty of fine woods, as Mahogany.
b. To change the tone of woods, such as making Oak darker.
c. To give inexpensive woods, such as Pine, the beauty of hard-woods.

III. MATERIAL
JOHNSON'S WOOD DYE of desired shade.
Turpentine for Oil stains, or Denatured Alcohol for Spirit stains.
Note 1. Wood Dyes are composed of transparent dye colors (not pigments) carried in either an oil or spirit (alcohol) vehicle.
a. Oil stains work more easily, dry a little slower, and are recommended for most new work.
b. Spirit stains are used for a very quick job, for small work such as basketry, models, etc., and can also be used over varnished surfaces because the spirit will penetrate the old finish.
Note 2. The same Dye gives different effects on different woods, soft woods absorbing more and showing darker shade.

IV. TOOLS and EQUIPMENT
Clean empty can, soft bristle or camel's hair brush, extra piece of same wood as that to be finished, clean soft cloth.

V. PROCEDURE
1. Surface must previously have been planed, scraped, and sanded perfectly smooth and must be perfectly dry and clean.
2. Wipe dust off surface.
3. Pour out enough JOHNSON'S WOOD DYE in extra can to do entire job.
4. Try on extra piece of same wood to see if it is exact shade desired. If you are going to wipe the piece you are finishing, wipe this sample to get same effect.
a. If too dark, thin Oil shades with turpentine (Spirit shades with denatured alcohol).
b. If too light, add Johnson's Wood Dye No. 178 to Oil shades (No. 172 to Spirit shades)
5. Application.
a. Get good brush full, wipe off excess on edge of can.
b. Flow Dye on with even steady stroke.
c. Brush with the grain—not across grain.
d. Do not brush over.
e. Finish one convenient section or panel at a time and then wipe it.
6. Wiping.
Note: It is not absolutely necessary to wipe JOHNSON'S WOOD DYE, but it insures a perfectly even effect, though slightly lighter shade.
a. Allow Dye to set a few minutes and wipe off with clean soft cloth.
b. Wipe with the grain, not across grain.
c. Remove surplus stain that has run or lapped on to adjacent surfaces.
d. In case you have allowed stain to lap and become set, moisten with brush and wipe to even shade.
7. Allow Oil shades to dry over night, Spirit shades 4 hours.

VI. QUESTIONS
1. Name three purposes of Wood Dye.
2. Give general composition of Wood Dyes.
3. Explain difference between Oil and Spirit Dyes.
4. How are Oil and Spirit Dyes lightened and darkened?
5. Give three points to remember in applying.

RECORD (name, date, grade, etc.)

JOB SHEETS

Have you ever wished for something that would save you half the endless explaining you have to do? Could your students use a clear, simple, *practical* outline that would enable them to do their job right and know WHY they are doing it?

Johnson Job Sheets on Wood Finishing cover the application of Stain, Filler, Under-Lac (shellac), Enamel, Undercoat, Wax, Varnish and Varnish Rubbing. They combine the latest and best educational practice with the most expert practical experience. And to all users of Johnson Finishes they are

FREE

Making the Most of Your Budget

How do you buy? A pint of this, and a gallon of that, just as the need comes? Just any "varnish" or "stain" somebody shoves across the counter? Sometimes good, sometimes bad?

Those boys learning to do things Right, deserve the Best—perfect materials and reliable materials every time. But the busy instructor or supervisor hasn't time to "shop." The easiest solution in the world is the Special JOHNSON SCHOOL ASSORTMENT.

This Assortment will take care of 99% of your shop needs. It will give your students the finest materials manufactured and the funds available for your department will go farther and enable you to accomplish more.

The Johnson's school assortment includes **FREE** demonstrating materials — display panels — Text-books —a complete set of Job Sheets for *every boy* in your classes. And it will save you money!

Ask about it NOW!

S. C. JOHNSON & SON, Dept. IA3, RACINE, WIS.
"The Wood Finishing Authorities"

Please send me a specimen set of Johnson Job Sheets and all information concerning your Special School Assortment of Johnson Finishes.

Name .....

Position .....

School .....

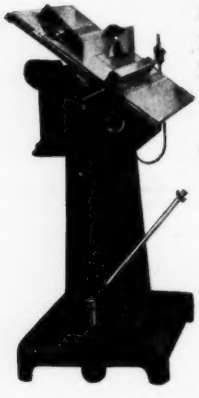
City and State .....

Teach MOST MODERN Woodworking Plant Practice

When all is said and done, technical education should teach actual, practical business practice.

The tendency in all woodworking plants today is to speed production and reduce overhead and operating costs.

Hundreds of up-to-date plants are using Union Woodworkers because they are better and faster on average small work, cost less to buy and less to run, occupy less space and are readily shifted from one department to another. Ideal for actual shop practice—and an ideal way to teach it. Write for information.



Gallmeyer & Livingston Co.
214 Straight Ave.
GRAND RAPIDS, MICHIGAN.

This Free Book—

This free book completely describes a number of woodworking machines which many schools are using to great advantage. Write for it.

UNION PORTABLE AND BENCH TYPE WOOD WORKING MACHINES

Good Work *Demands* Good Machines

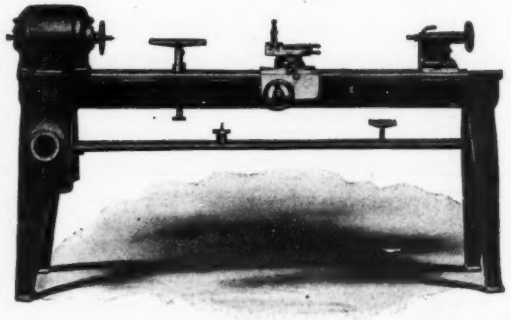
This American motor driven hand jointer is as safe as it is dependable—as versatile as it is accurate. It will help you to teach your pupils to appreciate good tools while training them to be good workmen.

When you write inquire about our Sander, Universal Saw Bench, Lathe and other American manual training equipment.

AMERICAN
SAW MILL MACHINERY CO.

MAKERS OF WOODWORKING AND SAW MILL MACHINERY
74 MAIN STREET, HACKETTSTOWN, N. J.

Motor Headstock Lathes

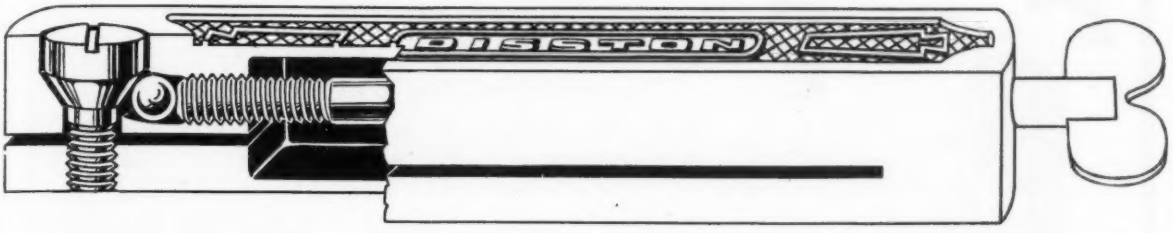


Our Motor Headstock Lathes are the last word in manual training school equipment. They can be equipped with either A.C. or D.C. motors. Various speeds are controlled by a speed regulating dial convenient to the operator. Complete installations of all woodworking equipment in the manual training departments of the largest and most modern high schools in St. Louis, the Theodore Roosevelt and the Beaumont, were made by this Company.

We manufacture a complete line of manual training equipment.

Hall & Brown Wood Working Machine Co.
Broadway, Tyler, Ninth Sts.,
ST. LOUIS, MO.

A ball-bearing lock holds this bevel secure



Your boys can work with confidence; the blade will not slip—

Disston No. 3 Bevel

In addition to the ball-bearing locking feature, you get in this bevel these advantages:

Wing nut at end of stock does not interfere with full view or use of blade. A decided advantage in school use.

Blade is offset so that a large surface of stock bears on the work. You get greater accuracy especially in laying out angles from moulded edges.

Bevel can be set at extreme length of blade on account of the positive lock. Allows full use of tool. An exclusive feature.

Edges of blade are accurately ground straight edges, cut parallel. End of blade is true 45° angle.

The many features of this Disston Bevel, and its sturdy, durable construction, make it ideal for boy use. Specify it for your school.

Another Disston tool improvement that makes for easier and better work. This time a simple, practical lock to hold the blade of a bevel.

A ball-bearing lock! New in principle and new in the positive locking results it gives.

We've cut open a bevel to show you how it works. Look at the drawing. The only working parts are the rod through the handle with a wing nut on the outer end; the ball-bearing, and the bevel screw.

To lock the bevel blade just give the wing nut a slight turn. This thrusts the rod against ball-bearing—wedging up the bevel screw. This action closes the slot in the handle—gripping the blade like the jaws of a vise.

The blade stays where you set it, till you release the wing nut. Knocks or jars do not disturb the adjustment. Accurate angles are assured on work like saw horse, valve core box, dado layouts, and special angle joints.

Here's a bevel to depend upon . . . a tool that gives a boy a new confidence in his work.

Write for information on the No. 3 Disston Bevel. And ask for folder picturing and describing other Disston Tools for the school.

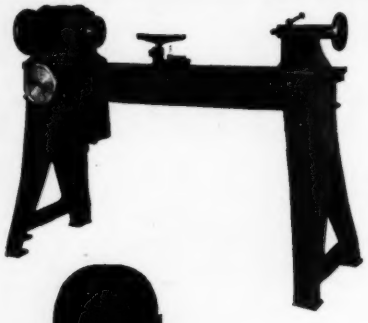
Henry Disston & Sons, Inc.

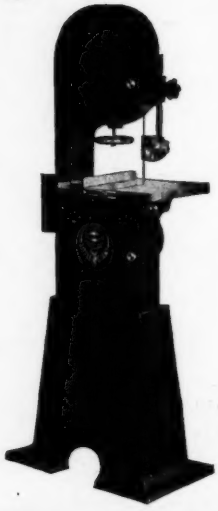
Makers of "The Saw Most Carpenters Use"

Philadelphia, U. S. A.

DISSTON

SAWS TOOLS FILES KNIVES STEEL





Economy Service Efficiency

Those are trite words, but they have a vivid meaning.

When you get better equipment for less money, that is ECONOMY;

When your equipment is always ready to go and never bothers, that is SERVICE;

When your equipment is perfectly adapted for the work in hand and fulfills all requirements, that is EFFICIENCY.

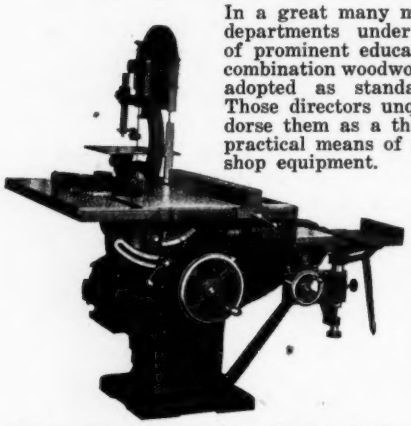
Little Giant Lathes and Band Saws are specially designed for the Vocational Training Shop with particular emphasis on the features of Economy, Service, Efficiency—and the greatest of these is Efficiency.

A new handsome, well illustrated catalog on request.

LITTLE GIANT COMPANY

223 ROCK STREET MANKATO, MINNESOTA

Used and ENDORSED by Prominent Educators



In a great many manual training departments under the direction of prominent educators Tannewitz combination woodworkers have been adopted as standard equipment. Those directors unqualifyingly endorse them as a thoroughly sound practical means of economizing on shop equipment.

Saves the Cost of Several Machines

Nearly all of the sawing, planing, boring and mortising operations can be done on it just as they are done on the individual machines, and it is quality built in every detail. Ball bearings equipped with Gits oilers used throughout. 2 H.P. Motor—three operators can work at it simultaneously — unhampered — safely. Completely guarded. Attachments put in motion without shifting belts.

By all means get the facts concerning this machine before equipping your new departments.

Simply ask for Bulletin E & E-2

THE TANNEWITZ WORKS

3 FRONT AVE. GRAND RAPIDS, MICH.

TRADE MARK

"Jorgensen"

REG U S PAT OFF

STEEL SPINDLE HAND CLAMPS

In each line of products there is always a leading make. In the Hand Clamp field the "Jorgensen" Peerless Adjustable Steel-Spindle ones are the leaders—and if you firmly believe in using the best, you will specify them in your requisition.

Adjustable to various positions. Grips to angular or straight work with equal facility. Twelve sizes and each priced right.

"PONY" Cabinet Clamp

For lightness combined with strength this clamp has no equal. All parts are selected from the best materials obtainable and we have spared no effort to make the "Pony" the finest thing of its kind on the market. Made in sizes to open 18 to 72 in.

Write us for Catalogue No. 5-EE and prices or get them from your dealer.

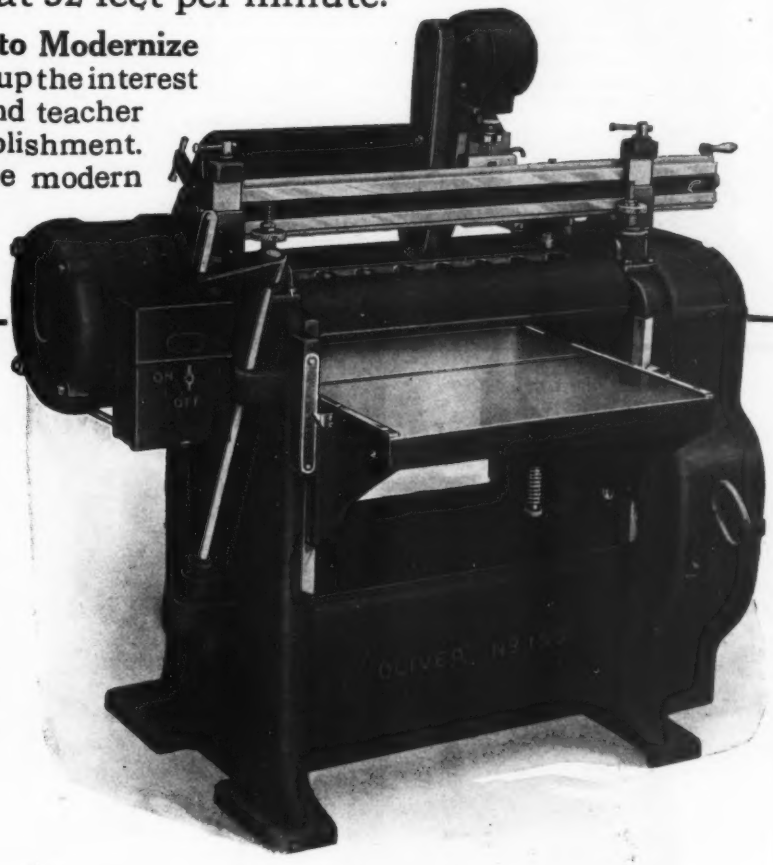
ADJUSTABLE CLAMP COMPANY
216 No. Jefferson St., Chicago, Ill.

OLIVER
HIGH GRADE MACHINERY

One Minute Planes A Panel

Whether it is a table top, a piano bench, or what not. This machine surfaces one side of your work and brings it to desired dimension, leaving a beautiful and smooth finish. The "Oliver" No. 199 Surfacer actually feeds at 32 feet per minute.

To "Oliverize" is to Modernize and nothing keeps up the interest of both student and teacher more than accomplishment. To accomplish use modern production machinery.



Every User is a Booster

Let us give you the names of users in your district so you can get their story direct.

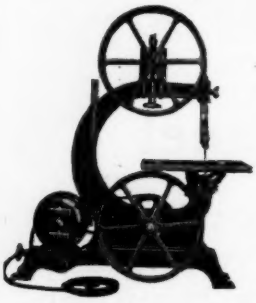
Circular?
Catalog?

OLIVER MACHINERY COMPANY

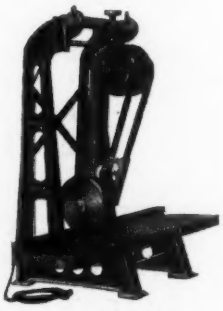
GRAND RAPIDS, MICHIGAN, U. S. A.

H & A PORTABLE ELECTRIC BENCH MACHINES

GIVE THE VOCATIONAL SCHOOL



1. More machines for the same money.
2. More students an opportunity to obtain machine experience.
3. Cheaper operation and maintenance of machines.
4. Safer machines for student use.
5. More interest among the students.
6. Larger variety of woodworking machine experience.
7. Same experience obtained on larger machines.



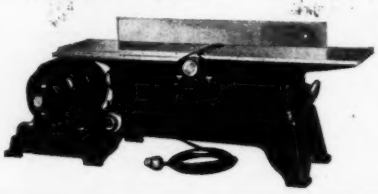
Ample Power - Accurate Work - Low Costs.

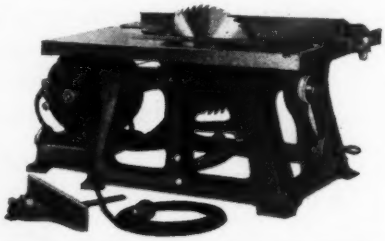
Any school can make their Manual Training Department more efficient with a number of these bench machines in place of a few massive machines.

The small school that hesitates at the cost of equipping a Manual Training department can now purchase these four machines for less than $500.00.

These machines are large enough to handle any work usually done in Manual Training classes. They are equipped with motors that will insure plenty of power for all work within the range of the machine. Each machine has guards (not shown here) that fully comply with the laws.

These machines are built to quality standards that guarantee accuracy in operation. Low costs are maintained by improved designs and methods of manufacture.





Write for descriptive circulars on "The Quality Line"

Heston & Anderson
609 West Depot Street
FAIRFIELD, IOWA.

The Silver

Portable Electric Saw

For Rip-Sawing, Mitreing and Cross Cutting
Attaches to nearest Light Socket
A Compact, Powerful and Inexpensive Saw for the Manual Training Department

No. 895
A Silver Quality Product

Send for complete description and prices

THE SILVER MFG. CO., Box 397, Salem, O.
Manufacturers of Quality Goods Since 1854.

Improve Your Shop Equipment

Huther Bros. Dado Head

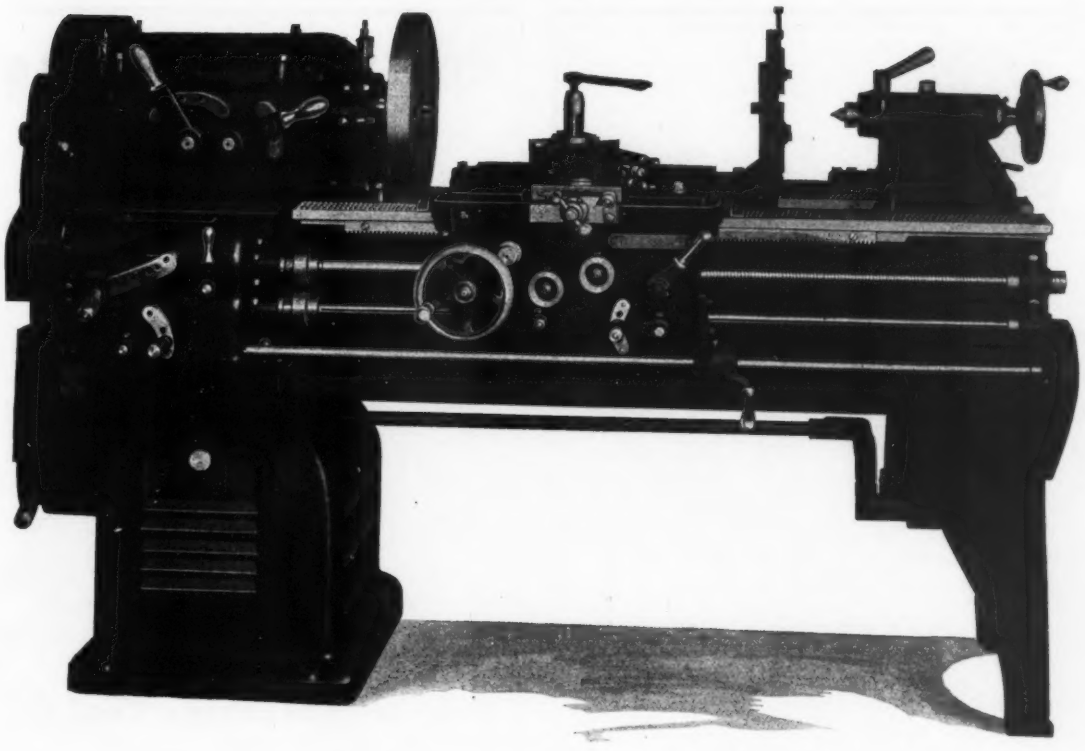
A Huther Brothers Dado Head will speed up and simplify your intricate cutting and grooving. It consists of two outside cutters and enough inside cutters to perform the required cut. The cutters can be used in pairs or in any combinations desired.

Huther Bros. Cutter Head

Huther Brothers Round Cutter Head is especially desirable for jointing and running light mouldings on saw mandrels. The knives are set with the use of a headless set screw and flanged side plates strengthen the head and keep knives from twisting while being set.

HUTHER BROTHERS SAW MANUFACTURING COMPANY
Rochester, N. Y.
Makers of Better Saws for More Than 50 Years

Write for catalog No. 46 illustrating and describing the entire Huther Line.



O.K.'ed by Schools from Coast to Coast!

The *14" x 6'*

SIDNEY

Geared Head

Lathe

(*Heavy Pattern Type*)

The 14" x 6' all geared head, heavy pattern Sidney Lathe shown here was originally designed and built for the Manual Training Schools of Boston, after their specifications and requirements. Since then other schools, including the city schools of Los Angeles, have found this lathe fittingly adapted to their needs and have ordered them in no small numbers.

This widespread approval of the Sidney All-Geared Head, 14" x 6' Heavy Pattern Lathe is, however, really characteristic of all Sidney Lathes adaptable to school use. They've won the endorsement of school buyers on merit. While moderately priced, Sidney reputation for dependability and efficiency has never been jeopardized by cheapened construction to meet low price competition.

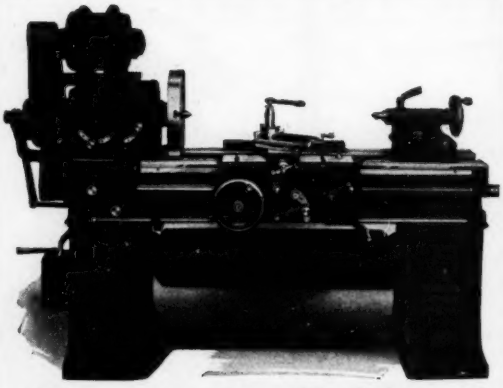
You'll want the particulars on the Sidney Heavy Pattern 14" x 6' Lathe shown here. Also on our Medium Pattern type. Address Dept. 403 and we'll gladly mail you full information.

The Sidney Machine Tool Company

SIDNEY, OHIO.

Ask us about our free Engineering Service to schools.

SIDNEY SERVICE



"Time tests all things"

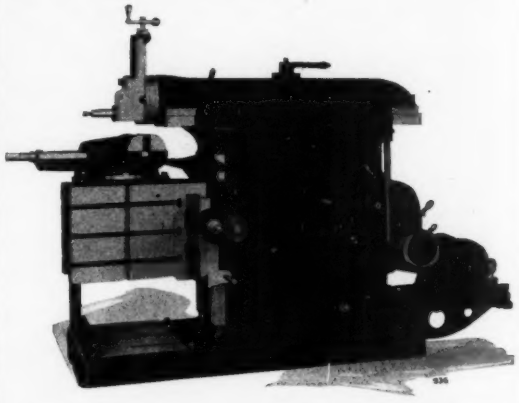
For 40 years we have been giving a good value lathe.
We believe, in this new Gold Seal Lathe, we are giving more actual value at the price than ever before.

Gold Seal SEBASTIAN LATHES GUARANTEED CORRECT

The Sebastian Lathe Co.,
602 Culvert St. CINCINNATI, O., U. S. A.

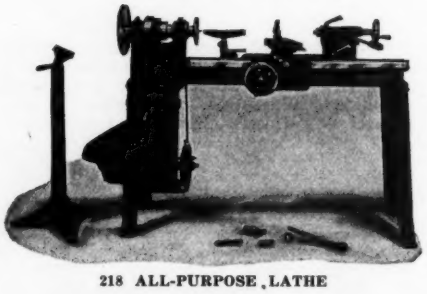
"OHIO" PLANERS
and
SHAPERS

Suitable for Tool Rooms, Production Shops and Vocational Schools.



The Ohio Machine Tool Co.
Planers and Shapers since 1887
— KENTON, OHIO —

GTD



218 ALL-PURPOSE LATHE

SAFETY

IN THE CONSTRUCTION OF THE GTD ALL PURPOSE LATHE THE STUDENT'S SAFETY HAS BEEN OUR FIRST CONSIDERATION. These lathes are provided with individual motor guards, all operating levers are placed in the most convenient position, all moving parts are safely guarded. This protection is entirely adequate and the safety requirements of every state in the Union can be met with the open type motor, which is a real saving to the buyer.

For complete description write for bulletin No. 104.

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASS., U.S.A.

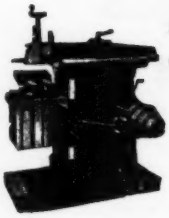
School Representatives
R. A. FIFE CORPORATION, Mamaroneck, New York

1845 — EIGHTY YEARS — 1925
Manufacturing Machine Tools

14"x6'—$450.00
16"x6'—$500.00
With Quick Change Gear Box
$85.00 extra

Thousands in use in shops all over the world giving daily satisfaction.

Meet the requirements of school shops because they are devoid of intricate parts and practically fool proof.



Send for catalogue describing the entire line of SHAPERS, MILLING MACHINES, LATHES and PORTABLE ELECTRIC SCREW DRIVER.

Industrial Education Dept.
THE JOHN STEPTOE CO.
CINCINNATI, OHIO

"Buffalo" Forges

for best

RESULTS—

Buffalo Down Draft Forges are training school favorites because they give teachers and pupils opportunity to concentrate on the work. The Buffalo "Down-Draft" forges use under ground piping for blast and exhaust, keep the smoke, soot and gases out of the shop, and eliminate overhead obstructions.

They always produce a hot fire, are easily controlled and outlast any other forge made.

Buffalo Forge Co.
482 Broadway, Buffalo, N. Y.

In Canada,
Canadian Blower & Forge Co., Ltd.,
Kitchener, Ont.

THE EFFICIENCY GRINDER
WILL PRODUCE A KEEN EDGE

A Real Tool

Built Right

Easy To Operate

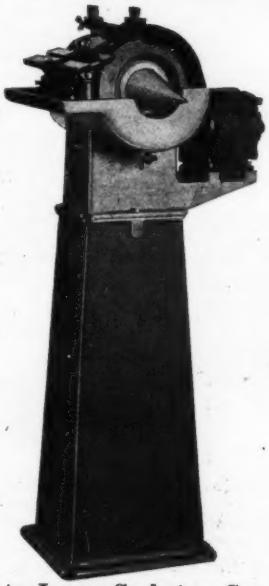
Low Cost Operating

Moderate in Price

Sturdy in Construction

Bench Type

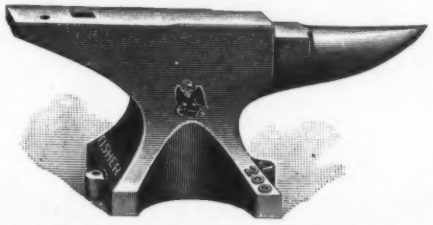
Pedestal Type



Plugs Into Lamp Socket — Cone Wheel
SEND FOR CIRCULARS AND PRICES
EFFICIENCY GRINDER COMPANY
326 W. WASHINGTON AVE.
MADISON, WISCONSIN

THE "EAGLE" ANVIL

The standard anvil for Schools. No deafening ring. Lessons given and heard without interference.



A DECIDED PREFERENCE FOR USE IN MANUAL TRAINING SCHOOLS

— A FEW OF THE MANY USERS —

Tilden High School, Chicago, Ill.
Manual Training High School, Brooklyn, N. Y.
Bushwick High School, Brooklyn, N. Y.
Camden High School, Camden, N. J.
Lawrence High School, Lawrence, Mass.
Mass. Institute of Technology, Boston, Mass.
Mechanics Arts High School, Boston, Mass.
Rensselaer Polytechnic Institute, Troy, N. Y.

Manufactured Since 1843 by the Eagle Anvil Works

FISHER & NORRIS — TRENTON, N. J.

"THURSTON'S—What do they sell?"

"Why, those 'Hard-to-Get' materials, tea wagon wheels, inlays, copper chest trim, lamp shades, art glass, mirrors, cabinet hardware, glue, water stain powder, and scores of other things. Each item is of the best quality, fully guaranteed and at wholesale prices to Manual Arts Instructors and Schools."

QUALITY SERVICE FAIR PRICES

THURSTON MANUAL TRAINING SUPPLY CO.

Jobbers and Manufacturers

ANOKA MINNESOTA

Catalog mailed gratis

No. 427 Double Domestic Science Table.

None Better Made

For information regarding our full line of superior manual training benches, domestic science, sewing and drawing tables, vises, laboratory furniture, etc., write to

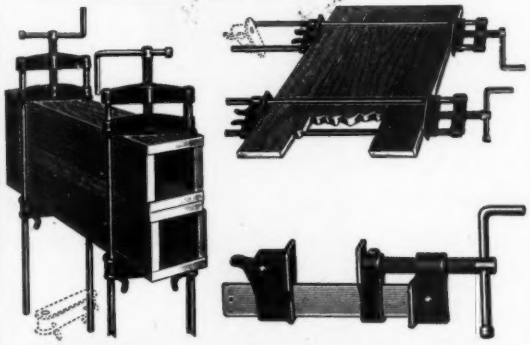
C. CHRISTIANSEN

Manufacturer of this line since 1898

2814-2842 West 26th St., CHICAGO, ILL.

HARTFORD SINGLE DOUBLE BAR CLAMPS

Our No. 3 Hartford Double Bar Clamps are a decided aid in class work since they eliminate the possibility of buckling. Better results are accomplished when the danger of spoiling the work is minimized. The bar on each side of the wood maintains uniform pressure.



HARTFORD No. 6 Double Bar Clamps are used extensively as presses—for veneering, gluing posts, chair arms, etc. The cost is much less and the saving worth your consideration.

Single Bar Clamps are made in Loose and Stationary Handles.

Send for Catalog No. 10, which contains complete price list on single and double bar clamps.

HARTFORD CLAMP CO.

308 Pearl St. Hartford, Conn.

This GLUE POT *Kept Hot 3 Years*

RECENTLY one of our customers reported that he had not turned off the current on his STA-WARM electric glue pot for 3 years—it is still giving him complete daily service.

Because of basic STA-WARM patents, no other make of heater or pot for glue or other fluids can give service anywhere near equal to STA-WARM.

Nor can any other manufacturer today build heaters to the almost unlimited size and electric heating capacity offered by STA-WARM engineers.

If you want to heat any volume of fluid quickly and evenly without the danger of scorching, to hold it at a fixed temperature indefinitely with no attention whatever — if you want to save time, worry, trouble, spoilage—if you want to increase production, and improve quality—all for less cost, use

Sta-Warm

Electric Pots and Heaters

ROHNE ELECTRIC COMPANY

2422 25th Avenue, South, Minneapolis, Minnesota

The No. 10 Crescent Saw Table is a sturdy, substantial machine with every convenient adjustment for general factory work and will meet every requirement for a practical saw table with self-contained motor for your manual training department.

Send today for circular giving complete description. Also ask for circular of band saws, saw tables, shapers, jointers, variety wood workers, planers and matchers, disk grinders, cut off table, swing saws, borers, hollow chisel mortiser, tenoner, universal wood workers, self feed rip saw.

THE CRESCENT MACHINE CO.

25 Main St.,

LEETONIA, OHIO.

Wallace

PORTABLE MACHINES

Wallace 16" Band Saw
Wallace Universal Saw
Wallace Plain Saw
Wallace 6" Jointer
Wallace 4" Planer
Wallace 6" Lathe
Wonder Spindle Sander
Wonder Disc Sander
Wallace Electric Glue Pot —Automatic Heat Control

Announcing

NEW MANUAL TRAINING EQUIPMENT FOR SCHOOLS

No. 8 Wallace Portable Saw

Like all Wallace Machines this new Model No. 8 Universal Saw has built in direct-connected - motor —no belts to slip and dissipate power. Takes its power from any light or power circuit. Many other advantages make this new model ideally suited for school work. To list a few: Air cooled motor—two cross cut fences adjustable to 90°—arbor tilting saw (you tilt saw and not table) 8" saw raised or lowered for various depth cuts—cuts through 2¼" stock. Single phase or direct current ½ horse power or three phase motor. Metal base on casters. Shutter saw guard above table and aluminum guard completely houses saw below table. Removable throat allows quick adjustment for dado heads and cope heads. Cuts 12 inches between rip or cross cut fence and saw blade. Table 25" x 25".

Write for catalog and full particulars of new Model No. 8 Universal Saw.

JOB SHEETS

Unusual plans and specifications of great interest to all instructors and students of manual training are issued regularly. If you wish we will put your name on our mailing list.

J. D. WALLACE & CO.

140 So. California Ave.

Chicago, Illinois

LUMBER FOR

ELEMENTARY WOODWORK, CABINET MAKING, CARPENTRY, PATTERN MAKING, FARM WOODWORK.

JOHN S. BENEDICT LUMBER CO.
419 No. Halsted St. CHICAGO
MANUAL TRAINING
L - U - M - B - E - R
We carry everything in our block of sheds, and can furnish anything you want. No order is too large or too small for us to fill.

PALMER PLY-BASE Tray and Basket Bases
Bored for Reed Weaving
SPECIAL SAMPLE OFFER

PALMER PLY-BASE made of selected 3 ply veneered panels.
PALMER SOFTWOOD BASE Re-sawed kiln-dried dressed two sides Basswood Lumber.
No unsightly nail holes Quality Guaranteed
Sanded 2 sides and edges Immediate Shipment
Would also like to quote your DOWEL and PLYWOOD requirements.
G. M. PALMER, 2247 Lumber St., Chicago, Ill.

COMPLETE LUMBER SERVICE
Consult us regarding your requirements
"A Dozen Boards Or A Dozen Carloads"
JOHN SCHROEDER LUMBER CO.
MILWAUKEE, WIS.

T. A. FOLEY
We Furnish Schools With
Lumber, Panels, Dowels and Cedar Chests
PARIS, ILLINOIS

BLACK WALNUT
We manufacture Black Walnut and other hardwood lumber, selling direct to schools.
MEEK LUMBER CO.
PERU, NEBR.

Aromatic Tenn. Red Cedar Boards—Small shipments a specialty. Write us for prices, delivered at your railroad station.
EARTHMAN LUMBER CO.
MURFREESBORO, TENN.

Geo. L. Waetjen & Co.
713-723 PARK ST., MILWAUKEE, WIS.
PLYWOOD! In various woods and thicknesses, in stock for immediate shipment.
Write for Prices.

Maisey & Dion
2349-2423 So. Loomis St.
CHICAGO, ILL.
Why not save TIME and TROUBLE? Deal with a concern that has SATISFACTORILY supplied the LEADING SCHOOLS with Manual Training Lumber for over FIFTEEN YEARS.

FOR FINE HARDWOODS
Cut from virgin timber, write
Ozro M. Wilsey, Franklin, Pa.
Dealer in hardwood lumber.
Chestnut, cherry and walnut a specialty.
Cherry—80% is, 18" wide. 4/4" @ $14. 5/4" @ $17. 6/4" @ $17.
Chestnut—6 to 20" wide. 40% over 12". 5/4" @ $14. All over 20" @ $19.
Nearly any size in maple, oak, ash and hickory. Prices are for 100'. No. 1 stock, S2S, and freight paid to 600 miles.

PANELS

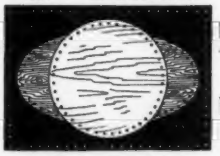
Direct From the Manufacturer At Wholesale Prices

Large assortment of plain and figured woods in all standard sizes shipped promptly from stock.

Send for our monthly stock list with prices.

Algoma Panel Company
1524 South Western Ave.
CHICAGO, ILL.

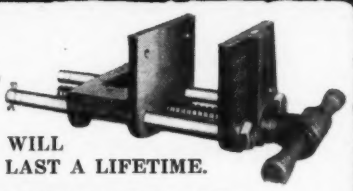
Veneered BASKET & TRAY Bases

IMMEDIATE SHIPMENT
SMOOTH TWO SIDES

ENGCO PRODUCTS
PROPERLY BORED
BEAUTIFUL GRAIN

Drawing Boards
Peg Boards
Send for Price List
Clay Model Boards
Ply Wood - Dowels

ENGLEWOOD TOP & PANEL COMPANY
CHICAGO 1635-39 W. Pershing Road ILLINOIS

MORGAN VISES
Solid Nut-Continuous Screw

THE SIMPLEST AND STRONGEST MANUAL TRAINING VISE MADE.

WILL LAST A LIFETIME.

MORGAN VISE CO.
558 Washington Blvd., Chicago

Make Pease Your Buying Headquarters

WHEN you need blue printing equipment and supplies for your school drafting room this organization can render you a real service. We carry in stock a complete line of the most up-to-date drafting room furniture, office and school supplies on the market. Shipments are from stock, every item is guaranteed and prices are consistent with the quality of the goods. Send for our new furniture and drawing instrument catalogs.

The C. F. Pease Company
802 No. Franklin St., Chicago, Ill.

SPECIFY
Higgins' Vegetable Glue

A dense, powerful, glue-like paste; THE all-purpose adhesive. Most reasonably priced — the cheapest product of similar quality on the market.

It Insures Economy

wood, glass, metal or leather. For kindergarten work also, and for pasting and mounting scrap pictures, clippings, etc.

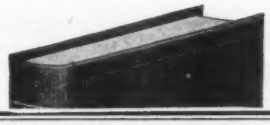
Teachers of arts and crafts know that HIGGINS' Vegetable Glue is ideal for sticking paper or cloth to each other or to

Specify Higgins' Vegetable Glue, the all-purpose adhesive. In lacquered tin cans for economy's sake: ½, 1, 2, 5 and 10 lb. sizes.

CHAS. M. HIGGINS & CO., 271 Ninth Street, Brooklyn, N.Y.
Chicago *London*

HIGGINS'

Vegetable Glue



The book you have wanted —is here

JUST OUT

The literature of industrial education has abounded in texts of course content. Here is the first complete coverage of course methods—giving the principles of psychology and pedagogy as applied to the teaching of industrial subjects—the accepted principles of education in the light of the work of the vocational and trades school teacher.

A teacher's text you will find worth knowing

Methods of Teaching Industrial Subjects

By Arthur F. Payne
TEACHERS COLLEGE, COLUMBIA UNIVERSITY
293 pages, 6 x 9, illustrated, $3.00
With an Introduction by Dr. David Snedden

This book is the first book devoted exclusively to the pedagogy of industrial education.

It is written with the sole purpose of giving to teachers of industrial subjects, who are recognized as masters of their trades, that training in teaching method which teachers of academic subjects have.

The first complete book on the subject

The book contains the first clear statement of the laws of learning, the principles of education, the standardized lesson types, the standard lesson plans, the laws of attention, interest and effort, as applied specifically to the teaching of industrial subjects.

It also gives detailed methods of school-shop management, methods of assigning grades and developing grading systems, and the use of job-analysis for the purpose of discovering and organizing teaching material.

A self-help manual for the teacher
A text for the teacher-in-training
A reference for the superintendent

The book brings together the fundamentals of the technique of teaching and indicates their use in the teaching of industrial subjects.

Be sure to see this new text—
Send for a copy on approval

It is the first book to formulate in a clear, concise manner the information on:

—educational psychology; *—pedagogy;*
—methodology; *—special teaching devices;*
—terminology; *—philosophy of trades teaching;*
—history of trades teaching;

which so many teachers of industrial subjects have wanted.

McGRAW : HILL

FREE EXAMINATION COUPON

McGRAW-HILL BOOK CO., Inc.
370 Seventh Ave., New York
Send me on approval copy of Payne—Methods of Teaching Industrial Subjects, $3.00.

I agree to return the book if it is not adopted in my classes, or to remit for it.

Name .....
Address .....
School .....
Official Position .....

Ind. A. 8-1-26

CLASSIFIED WANTS DEPARTMENT

The rate for classified advertisements is $.07 per word per insertion, payable in advance. All wants subject to approval. Minimum 25 words. Forms close on 5th of the month preceding date of issue. Write for discount on yearly insertions.

ART MATERIALS

Things to Paint — Polychrome, plaques, pictures, Gesso, Italian Clay, modeling wax, celluloid novelties, parchment shades, glow beads, water color cards and mottoes. Catalog Free. Coover Studios, Lincoln, Nebr.

BASKETRY

Basketry Materials—We carry a complete line of basket making materials including Kindergarten reeds, all sizes, round and flat, in one pound packages. Our line includes raffia, French willows, straw braids, Hong Kong twisted grass, basket bases, rattans, chair cane, dyes, etc. The Jayson Company, Inc., 217 Mercer St., New York City.

Basketry Materials—We have everything for basket making, including reeds, willow, chair-cane, Indian splints, ash splints and wooden bases. Send Fifteen Cents for Samples, 65-page Catalogue and directions. This contains illustrations of over 500 baskets, trays, frames, etc., with suggestions as to making them. Lewis Stoughton Drake, Inc., 33 Everett St., Allston, Boston 34, Mass.

Everything for Elementary Handwork — Also for basketry, weaving, bookbinding and chair caning. Mounting boards, Walderaft dyes, crayons, burlap, scissors, punch and eye sets. Thomas Charles Co., 2249 Calumet Ave., Chicago.

Basketry Materials—Reed, Raffia, Bases, Pine Needles, Ash Splints, etc. Free Basketry Catalogues. J. L. Hammett Company, Cambridge, Mass.

BATIK

Manual Arts Supplies—Circular and straight knitters. Bookbinding Material, Bead Looms, Stenciling, Stick Printing and Batik Supplies, Wooden Napkin Rings, Plasticine, Flower Pot Moulds. Free Manual Arts Catalogues. J. L. Hammett Company, Cambridge, Mass.

BOOKS

Vocational Text Books—For courses in Trade, Industrial and Manual Arts Education. Books submitted for examination (on approval). Write for descriptive catalogue. Dept. HS, American Technical Society, Chicago, Ill.

Svensen Drawing Books—Essentials of Drafting: Machine Drawing; Art of Lettering. Industrial Arts and Trade Books. Catalog free. Milford Book Company, 623-625 Norman St., Bridgeport, Conn.

BRUSH MAKING

Brush Making—A practical Special School and Manual Training subject. Send for our pamphlet which lists Bench Dusters, Floor Brushes, Mops, and other useful brushes, and tells how to make them. Magnus Brush Materials, 604 W. Lake St., Chicago, Dept. C.

Brush Materials—Brush Fibres, Tampico, Fibre Mixtures, Sterilized Horse Hair, Hair, Bristle and Tampico mixtures solid or taper stock, original lengths or cut to size. Samples matched. E. B. & A. C. Whiting Co., Burlington, Vermont.

CABINET HARDWARE

Special Service—We make it a rule to give special service on Cabinet Hardware for teachers. Send a postal today for our catalog. F. A. Rauch & Co., 410 S. Market St., Chicago, Ill. In one line of business for 41 years.

CANING

Finest Quality—We have cane, reed, webbing, flat rush, for all kinds of chair caning. Send Fifteen Cents for Samples, Directions and Catalogue. Louis Stoughton Drake, Inc., 33 Everett St., Allston, Boston 34, Mass.

Caning Material—We carry an excellent quality of imported Chair Cane at very low prices. Also handle Basket Reeds, Rattan, Willows, Hong Kong Grass, Dyes, etc. Wholesale only. Samples upon request. The Otto Gerdau Co., 14 Lispenard Street, New York City.

CATALOG

Manual Training Supplies—Catalogue Number Five contains unusual items. Glue brushes, glued cedar for chests, cluster lampstands; parchment paper and shades for lamps; wire lamp frames, etc. Free to schools. National Manual Training Supply Company, 120 S. 8th St., Minneapolis, Minn.

CLOCKS

Clock Movements—chimes, dials, part of cases in the knock down, blue prints, designs, instructions, in fact, all assistance required by manual training teachers. Write for free booklet today. American Clock Company, Nicetown, Philadelphia, Pa.

DRAFTING

Catalog G.—New illustrated catalog on Drawing Stands and Drafting Tables. Suitable for Schools, Drawing Classes, Artists, Draftsmen and Engineers. The Washburn Shops of the Worcester Polytechnic Institute, Worcester, Mass.

ELECTRIC SHOP SUPPLIES

Wiring Supplies and Fittings—Resistance wire, copper, brass, fibre and formica rods, sheets and tubes. Transite and asbestos in suitable sizes. Radio parts and all other equipment required in the electric shop. Write for price list. Tri. "K" Electric Mfg. Co., 2825 N. Troy St., Chicago.

FIBRE CORD

Art Fibre—See our full page advertisement regarding our complete Art-Fibre Weaving Service, Art-Fibre Cord, Stakes, Furniture Frames, Finishes, etc. Write for descriptive Folder. Grand Rapids Fibre Cord Company, Grand Rapids, Michigan.

FURNITURE PHOTOGRAPHS

Furniture Photos with sizes on them. $.50 per dozen. W. E. Rodick, Bar Harbor, Me.

FURNITURE TRIMMINGS

School Shop Instructors — Let your students beautify their furniture projects by using the Onward Sliding Furniture Shoe. Packed 6 or 12 in a box. Reasonably priced. Write Onward Manufacturing Co., Menasha, Wis.

LEATHER

Leather for Bags, Cases, Pocketbooks, Fancy Leather Goods and Novelties. Wilder & Company, 1038 Crosby St., Chicago.

LOOMS

Looms—Adapted for schools, hospitals and college use. Eureka rug filling, carpet warp, basket reeds. Send for catalog with price. The Reed Mfg. Co., Springfield, Ohio.

Write for New 1926 Catalog and special school discount on UNION Rug and Carpet LOOMS, now used in hundreds of schools and institutions. Also samples and wholesale prices on rug-making supplies: MAYSVILLE Warp and Rug Filler, TEXPLY Dyes and Stencils, UNION Hooked Rug Machines, Silk and Cotton Remnants for woven and hooked rugs. UNION LOOM WORKS, 286 Factory St., Boonville, N. Y.

Lane Looms for Hand Weaving—Four harness, built in two sizes, 27 and 45 inches. Also 45 inch size in 4, 6 or 8 harness, for Hospitals, Vocational Schools, or home use. Circular sent on request. Nuttelman Mfg. Co., Florence, Mass.

MODELING CLAYS

Modeling Materials — Plasticine, never hardens, Antiseptic, Ten Colors. Send for free sample. J. L. Hammett Company, Cambridge, Mass.

PHONOGRAPH SUPPLIES

Phonographs—Build a genuine Choraleon Phonograph and save one-half. We furnish motors, tonearms, blue prints, instructions and parts. Send for catalogue and free blue print offer. Also full line Radio supplies, Radio cabinets. Veneer stock. Choraleon Phonograph & Radio Co., 224—20th St., Elkhart, Ind.

PICTURES

For "Pictures of Students at Work and of the Work of Students" address Frank F. Frederick, School of Industrial Arts, Trenton, N. J.

POSITION WANTED

A Man of Wide Experience in teaching Shop and Drawing, and with a thorough knowledge of Tools, Shop Equipment, and Draughting Room Supplies and Equipment would like a position selling such Equipment. G. T. Boyce, Boonville, Mo.

REED AND RAFFIA

Free Samples—We will send you free samples of all our reeds and raffia for school use. Catalog and directions, 15 cents. Louis Stoughton Drake, Inc., 33 Everett St., Allston, Boston 34, Mass.

We are the oldest reed importers in this country and solicit inquiries. Wholesale only. Also handle Chair Cane, Rattan, Willows, Hong Kong Grass, Dyes, etc. The Otto Gerdau Co., 14 Lispenard Street, New York City.

SEMI-PRECIOUS STONES

Gem Stones for Jewelry Workers—Many interesting varieties. Assortments gladly sent on approval. George H. Marcher, 934 Santee St., Los Angeles, Calif.

TAPESTRIES

We have a wide variety of Tapestries and Velours, in all sizes, styles and designs. It will be a pleasure to send samples. Write us your wants. F. A. Rauch & Co., 410 S. Market St., Chicago, Ill. In one line of business for 41 years.

UPHOLSTERING

Samples—We will gladly send you Free Samples of our line of upholstering goods on receipt of inquiry. F. A. Rauch & Co., 410 S. Market St., Chicago, Ill. In one line of business for 41 years.

WANTED

Wanted—One drawing teacher at once in every school to demonstrate the Ames Lettering Instrument. Free blue print and circulars will be sent to any teacher who sends us a postal request. O. A. Olson Mfg. Co., Ames, Iowa.

Salesman—One who is now calling on schools, to represent in addition to his regular line, a standard and nationally advertised brand of tools that are used in every school shop. Address: I.A.M., Bruce Publishing Co., Milwaukee, Wis.

Wanted—Specialty salesman to introduce to high schools, vocational schools and colleges our complete line of drawing materials, drawing instruments—domestic and foreign, our new line of drawing tables, especially designed for school use, and our blue printing machines. Give experience and references. The C. F. Pease Company, 813-821 North Franklin St., Chicago, Ill.

Teachers Wanted — A few teachers of vocational and prevocational shop work will be needed in Hawaii next year. If interested send references and statement of training and experience. For information and application blanks write to James R. Coxen, Director of Vocational Education, 531 S. Hotel Street, Honolulu, T. H.

WEAVING

Weaving Supplies — Looms, Roving, Jute, Warp, Macreme, Belfast Cord, etc. Free Weaving Catalogues. J. L. Hammett Company, Cambridge, Mass.

Send for Color Card and Price List

27 distinctive colors preferred by the amateur for professional results

Devoe & Raynolds Co., Inc. :: 1 W. 47th St., New York City

BRANCHES IN LEADING CITIES

GOLD MEDAL CRAYONS · FOR EVERY USE ·

Art and Civic Pride

PLANTING and gardening, house painting and remodeling, clean-up campaigns, street improvements and outdoor advertising find development in the art classes.

For plans, drawings, posters and sand-table projects, "GOLD MEDAL" Products are without question both spontaneous and permanent in color character. They are always uniform in drawing texture.

"CRAYOLA" Wax Crayons and "SPECTRA" Pastels for sketches, "PERMA" Pressed Crayons for decorative plans and "ARTISTA" Water Colors for posters will insure success for the community art problems.

Munsell "GOLD MEDAL" Products in "CRAYOLA," "PERMA" and "ARTISTA" widen your color-choices. We shall be pleased to send you samples of any of our products. Our Art Service Bureau is *your* Art Service Bureau in co-operating in problems of supervision as well as class-room presentations.

BINNEY & SMITH CO.
41 East 42nd Street New York, N.Y.

Write us for Sample

SURE-GRIP GLUE

IN YOUR CLASSES

will make the work easier and more permanent. There is no waste from its use which makes it the cheapest glue to use.

Not affected by Dry Heat or any other atmospheric condition.

Buy from your jobber, or send order to us and we will see you are taken care of.

SURE-GRIP ADHESIVES, INC.
ALBANY, N. Y.

POST

DEPENDABLE DRAWING INK

THE STANDARD BY WHICH OTHERS ARE JUDGED

IN THIRTEEN COLORS

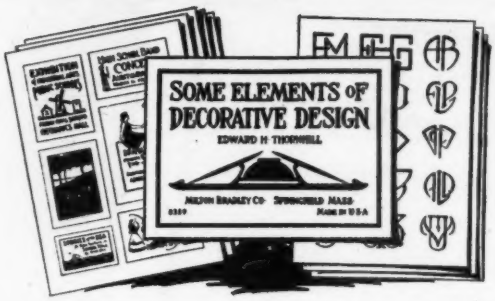
SEND FOR SAMPLE

THE FREDERICK POST

3621 N. Hamlin Ave. Chicago, Ill.

BRADLEY'S

SCHOOL ARTS SUPPLIES



Some Elements of Decorative Design

No. 8289. A portfolio by Edward H. Thornhill, covering various phases of decorative art, and the principles of design. There are ornaments, letters, borders, monograms, place cards, folders, etc. A real reference library to students and instructors in art.

Price, per set, 75 cents

Window Decoration Cut-Outs

8256. An innovation in artistic cut-outs. Each design shows back and front of the subject, which is to be colored, cut out, folded and pasted. Sections of the designs are cut out, giving the effect of a transparency when completed and hung in the window. Ten designs as follows:

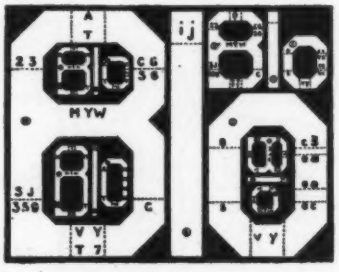
Little Bo-Peep	Frog Who Would a Wooing Go
Puss in Boots	Three Little Kittens
Merry Clown	Three Little Pigs
Wise Old Owl	Bird House
Little Red Riding Hood	Little Black Sambo

Price, per set, 50 cents

Alphabets and Letters for Lettering

No. 8324. Forty-two plates in the art and practice of lettering for students and designers of commercial work. Many styles of letters are included, bold poster, Gothic, Roman, Light Line, Italic, etc., with charts showing their formation. The most complete work devised for practical school use. No one is better qualified to handle this subject than Mr. Jacobs, and he has embodied in this series the sizes of letters most necessary to school work. Enclosed in strong, attractive box.

Price, $2.00



B-o-l Alphabets and Lettering Templets

No. 8322. B-o-l—Using only these three elements, the entire alphabet and all the numerals in any size or proportion are constructed. Six plates in an envelope, with instructions.

Price, per set, 30 cents

Poster Design for Paper Cutting

No. 8244. Complete method of paper cutting. Twenty-five plates showing outlines, also halftone print of finished poster. Full directions for cutting and pasting, with a colored sheet.

Price, 60 cents

Catalogue B

A complete line of educational materials is illustrated and described in Catalog B. Order from nearest address.

MILTON BRADLEY CO., Springfield, Mass.
SPRINGFIELD, MASS.

Boston New York Philadelphia San Francisco Atlanta
Chicago—Thomas Charles Co., Agents. Kansas City—Hoover Bros., Agents

Free to You

South Bend Machine Shop Course
For Apprentices and Students in Machine Shops
Project No. 26. 8-inch Bench Emery Grinder
Principal Features
Page
Machine Shop Course
Job Instruction Sheets
Sample Blue Print
List of Projects series "A" and "B"
List of Projects series "C" and "D"
Blue Print Layout Plans for School
Size of Lathe Suitable for School
Auto Mechanics Shop Course
Rough Castings and Supplies for
Bulletin No. 3
South Bend L
725 East Madison St.,

This Book for Supervisors and Instructors

Just Off the Press!

Here is the practical help you need to keep class interest at "white heat" —to make every hour of shop work intensely valuable to your students.

Write for Book 32-B

containing eighty practical Projects from which you can select the ones you want. Each Project consists of Blue Prints, Job Sheets and materials for making. Every step of the work is clearly explained and lathe operations are illustrated and described in accompanying Hand Book "How to Run a Lathe." This material is priceless —yet the entire cost to you is trifling. Book 32-B also describes—

The New South Bend Auto Mechanics' Course

Nothing like it has ever been offered before. Don't fail to send for your free copy of Book 32-B today.

SOUTH BEND LATHE WORKS
126 East Madison St. : South Bend, Ind.

Vol. XV
No. 3

INDUSTRIAL-ARTS MAGAZINE

March,
1926

Incorporating: HANDICRAFT and the ARTS AND CRAFTS MAGAZINE

Published Monthly by

THE BRUCE PUBLISHING CO.
354-364 MILWAUKEE STREET
MILWAUKEE, WIS.

NEW YORK: 30 CHURCH STREET

BOARD OF EDITORS
E. J. LAKE, *Champaign, Illinois*
S. J VAUGHN, *Mexico, Missouri*
WM. C. BRUCE, *Managing Editor*

BUSINESS STAFF
FRANK M. BRUCE, *Publisher*
JOHN J. KRILL, *Business Manager*
F. O. DUNNING, Jr., *Eastern Manager*

Bridging the Gap From School to Industry 75
R. W. Tarbell
The Home Job Sheet 78
E. F. Ferguson
Selecting Men for a Trade Education 79
S. G. Johndroe
Automotive Essentials—Lubricating the Engine II 82
Ray F. Kuns
Exhaust System as a Class Project for Sheet Metal Trade Classes 85
Harry E. Andersen and John F. Faber
Why "Daltonize" Industrial Education? 86
F. L. Allen
Wild Flower Designs—Article IX: Adapting Photographs for Decoration 91
Nettie S. Smith
The Space Filling Element in Design 92
A. G. Pelikan
Editorials 94
The Theory of Radio Reception 96
R. O. Buck
A Prescription for Production 98
Harley H. Goodwin
Stools 100
Herman Hjorth
A Checking Schedule for Mechanical Drawing 101
Floyd D. Slater
A Federal Subsidy to Vocational Education 101
Selling Vocational Agriculture in Hawaii 102
SUPPLEMENTS:
Scooter ..... Supplement No. 9
A. J. Goldborg
Stool ..... Supplement No. 10
Herman H. Hjorth
Tool Kit ..... Supplement No. 11
R. L. Welch
Suggestive Plate of Problems in True Perspective ... Supplement No. 12
V. L. Sherman
PROBLEMS AND PROJECTS:
A Blue Print Frame 103
Overhead Traveling Crane 104
J. A. Miller
Chuck Lifting Device 105
J. A. Miller
Making Close-Register Linoleum Blocks 105
F. A. Loomis
A Sewing Screen 106
Alfred S. Madsen
How to Fit an Ice Saw 107
L. M. Roehl
The Advantages of Casein Glue 108
C. F. Winant
Industrial Arts Vocabulary 108
F. S. Crispin
Charles E. Jones, Pioneer Manual Training Instructor 109
Chas. P. Coates
Vocational Education Society of Boston Holds Meeting 109
Fred. Ames Coates
School Crafts Club Meeting 110
Lloyd F. Stair
The Quadrangle Vocational Club Holds Meeting 111
Now, Are There Any Questions? 112
Chicago Industrial Arts Round Table 22a
Robert B. Bagby
Printing Teachers Will Hold Group Meeting in Syracuse 22a
News and Notes 24a
Buyers' News 32a

The Western Arts Convention

The 33rd annual convention of the Western Arts Association and the twelfth annual convention of the Vocational Association of the Middle West will meet in joint session March 17th to 20th, at the Hotel Fort Des Moines, Des Moines, Iowa.

The railroads have granted special rates of one and one-half fare, to be allowed upon the presentation of a certificate at the time of purchasing tickets.

The program includes the best talent the country affords. Emphasis will be placed on recent tendencies in the general development of the subjects. Mr. Royal B. Farnum, Massachusetts Director of Art, will be one of the speakers at the meeting.

Among the special features of interest are a teacher placement bureau for members of the associations, a visit to the Iowa State College at Ames, and visits to the Des Moines schools, educational and commercial exhibits.

Information concerning the meeting may be obtained from Mr. Raymond Fell, secretary of the Western Arts Association, Dayton and Baymiller Streets, Cincinnati, O., or from Mr. Leonard Wahlstrom, secretary of the Vocational Association of the Middle West, 1711 Estes Avenue, Chicago, Ill.

Entered Jan. 2, 1914, as second-class mail matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1926, by Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, Jan. 16, 1917. Member Associated Business Papers and Audit Bureau of Circulation.

SUBSCRIPTION INFORMATION—Subscription price, $2.50 per year, payable in advance. Canadian and Mexican postage, 35 cents, foreign countries, 50 cents. Copies not over three months old, 25 cents; more than three months, 50 cents. Notices for discontinuance of subscription must reach Publication Office in Milwaukee, at least fifteen days before date of expiration. Changes of address should invariably include old as well as new address. Complaint of non-receipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

EDITORIAL CONTRIBUTIONS—The Editors invite contributions bearing upon Industrial-Arts Education, Manual Training, Art, Domestic Science, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago.

"TAKING ADVANTAGE of Other Men's EXPERIENCE"

A Secret of Success in Teaching—As Well as in Business

Success in Teaching—as well as in Business—depends to no small degree upon **taking advantage of other men's experience.** Life is too short for each of us to go clear back to the beginning and work out every problem for ourselves. Accordingly, lessons in Manual Training deal largely with what have proved—**by experience**—the best methods for doing various kinds of shop work, etc.

Whose Experience—in machine shop and tool room practice, for example—could prove more practical and helpful to your students than that of leaders in the industrial field, like General Electric, Thomas A. Edison or Eastman Kodak?

What Machine Tools could your boys "learn on" to better advantage than the very same kind they are likely to use when they start to work?

A Book of Other Men's Experience

"STAR WITNESSES" is an attractive, illustrated, easy-to-read book of 32 pages, devoted almost entirely to other men's experience—industrial leaders like those mentioned above, Manual Training Teachers and others. We believe you would find it interesting at least, to compare their experience with your own—and so we'll be glad to mail you a copy if you will give us your name and address.

A Postal Will Do—As Well As The Coupon

A-4

Seneca Falls Machine Co.,
Seneca Falls, N. Y.

Please send me a copy of "STAR WITNESSES"

.....

.....

.....

Seneca Falls Machine Company

186 Falls Ave.
SENECA FALLS NEW YORK

THE INDUSTRIAL ARTS MAGAZINE

Volume XV MARCH, 1926 No. 3

Bridging the Gap from School to Industry

R. W. Tarbell, Milwaukee, Wis.

ONE of the major responsibilities of society is to prepare youth for adult activities. This has been a concern among primitive and savage peoples, frequently being as important as the hunt for food itself. No group of people can afford to shirk the job of educating its young folks, for civilization will advance only in proportion to the adequacy with which the oncoming generation is ready to cope with the problems of life as they arise. Primitive peoples built up their educational system around the central idea of making the learner proficient in given pursuits. It might be shooting the arrow, building a hut, or catching fish, but the training was given for a specific purpose. This same principle can be applied to our own time. If the children of today are to be equipped to solve the problems of tomorrow, their combined educational experiences must fit them for the job. School teachers are the special agents designated by society to assist in this task.

Our social organization is so developed at present that most people work with others in some industrial or business enterprise. The training problem becomes one of preparing people for a place in this modern world of work. If our schools are going to prepare pupils for the activities of adult life, specific things must be taught and certain people are to do it. It is the special function of the vocational school to give assistance to pupils in connection with their industrial activities. This means that the instruction should coordinate with the busy world of work. In this expanding field of education the vocational teacher is a large factor. There are many things for him to understand.

The following discussion is an attempt to indicate how pupils may be prepared for work. Some of the statements may seem theoretical, but they are suggestive of what may be done practically.

1. Securing the Job

(a) *Courses in occupational information:* Schools are taking a forward step in the matter of placement and employment by including occupational studies in the curriculum. The practice has extended far enough already to prove its usefulness. There are several very good texts on the market, suitable for elementary, secondary, or vocational schools. Studies in the occupations will furnish a running view of the nature of the different fields of work and assist pupils in the choice of a job. This will also place considerable material in the teacher's hands to assist him in his counselling and advisory activities. The pupil's perspective of life outside the classroom is materially enhanced and his ability to pick a job much improved.

(b) *Visits to industries:* Many teachers are taking advantage of opportunities offered by industries to visit factories and shops with their students. This has been the practice of classes in the engineering schools for some time. In recent years it has extended to many public schools, and offers an exceptionally interesting method of gaining occupational information, especially in the industrial centers. It is an excellent way to put pupils in touch with actual work conditions, and will assist them greatly in the matter of selection.

(c) *Talks by local citizens:* School people should not suffer under the illusion that all the teaching is done by them. Other means are available and should be utilized. There are public-spirited men in practically every community who can bring interesting messages to school children. They can be drafted from the various walks of life to tell the story of work. By planning a careful program these talks by local citizens can become an effectual part of the course. Much useful information will be given to the pupils, and the speakers will understand and support the schools more earnestly. Such an arrangement should tie up definitely with the teacher's efforts to give practical occupational information.

(d) *The school employment office:* Another means for aiding pupils in the matter of placement is the school employment office. This is a simple innovation in the school organization and need not be costly beyond what the needs seem to warrant. In a large school the duties may require considerable time and this will taper down to a small amount of work in villages. The essential thing is that someone in the organization is in charge of the work and has the information. This individual makes contacts with the industries and gives personal help to pupils. It is one of the very practical ways of caring for the placement proposition.

(e) *Conferences with parents:* Parents should be consulted when the question of securing employment arises. This means work, but should bring better results. The information that teachers are able to gather is sometimes too theoretical and needs to be balanced by some of the personal and practical views of parents. It is true that parents' ideas may not always be for the best interests of the child, in which case the instructor has the added job of teaching parents, also. This is part of the work of the school in these days when our conception of the school is expanding until we see it as a system of universal service in education. The results of such conferences are most likely to be a better understanding, a more satisfactory selection of employment, and more loyal school patrons.

2. Starting to Work

(a) *Beginning by easy stages:* Engineers tell us that machines should be broken in gradually. Most everyone knows that an automobile needs a few runs of easy driving before it is put into regular service. The farmer puts a colt to work by degrees. With all this opportunity to observe a proper procedure, society is still willing to let its children start to work in a sort of catch-as-catch-can method. It may sound impracticable to propose that the beginning days of juvenile employment be made educational, with the emphasis on the development of youth rather than on production. The logic of such an arrangement cannot be denied, however and people will some day come to see the reasonableness of the idea. The school can begin now to point out the virtues of this fuller conception of the functions of all the social forces, as they bear upon the problem of youth in employment.

(b) *Supervised entry:* One very practical method of breaking in juveniles is to have a system of supervised entry. The underlying philosophy is that a new employee is an asset, a possible diamond in the rough, and is worth the investment of time and money, necessary for a right start. Industries know already what it costs to launch a new person in the organization. It should be a simple matter to go a step farther and devise a work program, under supervision, for the purpose of breaking in children gradually, giving them an insight into more than one job, and affording an opportunity to study them in a scientific way. Some large corporations, such as the Chicago telephone companies, already have such a system of induction for beginners. There is a chance for the schoolmaster to develop this plan with local employers. It is distinctly an educational problem.

(c) *Counsellor activities:* The school counsellor is another aid during the beginning days of work. This is a comparatively recent development in the school, although the work of the counsellor has been going on in part for some time. Many schools do not have anyone who is charged with performing the counselling functions, but the practice is growing in favor and usefulness. A counsellor can be of especial assistance to young people who are starting to work. He knows the difficulties and perplexing situations confronting them and is in a position to give them the advice and encouragement they most need. The counsellor in the full-time school must devise a way to meet these young people, either by visiting them at the place of employment, at the home, or by having them come back for a conference with him at the school occasionally. This will not always be an easy matter. In the part-time school, where the pupils are at school and work alternately, it is easy to meet and counsel with them.

(d) *Aid of school courses:* It should not be too far afield to expect the curriculum itself to supply part of the preparation. This can be done in a very real way where it is possible to do a certain amount of work on a production basis. Such an arrangement is comparable to conditions in employment and can serve as a real test of the pupil's ability and readiness to enter industry. This will need to be worked out rather carefully and in many small schools it will be hard to do much with such a plan. Some classroom work can be done, however, to acquaint the pupils with conditions of work and with the part they will be expected to take.

3. Shop Associations

(a) *Class discussions:* There are certain personal contacts to be made by the young worker and these can be adjusted in part by the school. As boys and girls enter industry they become associated with other people, and begin to adjust their activities and thinking to fit in with the new surroundings. It goes without saying that there will be a process of reconstruction going on for most beginners. Some will not be strong enough to withstand the cross-currents that beset them and will fare badly. The school has a task to perform here. Along with the other work in occupational information there should be class discussions on these personal matters that pertain to conditions in the industries. Discussions on hypothetical situations will fortify many a young person against the discomfitting circumstances that are certain to arise during the first few months of work. The teacher should be a person of experience and understanding to bring the best thought to bear upon these questions. A mere academic description of the situation will not suffice.

(b) *The moving picture:* Considerable advancement has been made in recent years in visual instruction. The development of the moving picture has made it possible to bring educational experiences to the pupils in more effective ways than formerly. The moving picture is an excellent device for conveying occupational information. While it doubtless has its limitations in the matter of imparting trade skills, still it is a very good method for telling the story of industry. It can be used to present vivid stories, not only concerning methods of production, but as to the characteristics and activities of the different types of employees found here

and there. It may have more effect upon the plastic ideas and ideals of young people than many hours of study or lecture.

(c) *Special advisement groups:* The business of educating pupils for their life activities is so broad a matter that every wholesome influence should be brought to bear upon the situation. This has been hinted at already. The teacher is in a position to direct many of the educational features and to coordinate all the forces. After the class discussions and the motion pictures have been used, the work is still incomplete. The school may well call upon industry and local citizens of standing to act as special advisors on the whole matter of shop associations. The personnel of these committees should be selected with care, for the pupils will be inclined to pin great faith upon the advice they give. A group of select people can set young workers right on many of the perplexing problems that arise in the shop contacts. Such conferences can be carried on in school or even in industry. The teacher can exert a guiding influence in the programming of activities in either case.

4. Getting Used to Work

(a) *Practice days at school:* It is a comparatively easy matter to give instruction of various kinds about work. Young people quickly grasp much of the theory concerning methods, processes, people, etc. It is still necessary for them to learn how to work. It were well if this could be done gradually. An arrangement whereby pupils could work Saturdays, or during the holiday season, would be very beneficial. Work during the summer vacation has a stimulating and wholesome influence.

(b) *The school as a shop:* The school must not forget its purpose and serve to push pupils too rapidly into industry and production, and some people are afraid there is a drift in that direction. It is possible in many schools, however, to furnish educational experience of a distinctly vocational nature for those who will soon be going to work. This should be worked out after the pattern of the industries to bring the pupils up to shop requirements.

(c) *Conferences and discussions:* After work has been begun there should be a program of follow-up conferences. The usefulness of this method has already been discussed and is mentioned here only as a possibility and that it may not be overlooked.

5. Overcoming Disappointments

(a) *Disillusion pupils in school:* Society in general is coming more and more to the point of view that the forces of education are working about us all the time and that the school is furnishing only a part of the training. School people cannot always be held accountable, therefore, when mistakes occur, but they are responsible for at least one thing. They should tell the truth about the world of work or say nothing. It is harmful for an instructor to paint jobs in any other than the correct colors. Good teaching in this respect would fortify pupils against later disappointment.

(b) *Other methods:* The reader will begin to discover by this time that the teacher can use certain methods in a number of different ways. Two other plans can be used to overcome some of the initial disappointments of pupils. One is to give them a tryout in part-time jobs. The other is the follow-up conference. Both of these, if properly used, will be productive of good results.

6. Fitting the Body for Work

(a) *Athletic practice:* There have been educational systems in the past holding to the principle that the school should prepare the whole man for life. Perhaps we are getting back to that ideal again. Certainly the school should be concerned about bodily, as well as mental, development. Some kind of systematic work in athletics will not only keep pupils in good physical condition, but will reveal constitutional defects, which might render them unfit for certain work.

(b) *The physical examination:* In large school systems it is becoming quite a general practice to have some kind of health inspection. The benefits of this plan cannot be estimated and no arguments are needed in its behalf. It is an excellent means of finding out the fitness of pupils for work. The instructor in the small community is still handicapped by lack of such provisions and may well become a propagandist for a health clinic in his school. As a result of the findings on the athletic field and by the physical examination, the school can map out a more effective program of part-time work for the pupil and can advise better concerning a schedule of home activities.

7. How to Develop Skill

(a) *The school's part:* The school is coming to understand its place, and also its limitations, in the program of training. It would be very difficult to develop complete skill in a pupil, so that he could successfully compete in the open market, unless the school were able to provide conditions as found in industry. It is possible, however, to provide the means for acquiring the initial skills. This is a part of the function of the school. It is the duty of the teacher, not only to discover aptitudes and capacities, but to give the initial training.

(b) *Supervised training in industry:* If complete skill and preparation for an occupation cannot be gained until a pupil has had contact with industry, then we may as well recognize that industry has a part to play in the educational program. It is well for employers to recognize this fact also. Many of them are too willing to shift the responsibility onto the school entirely. It will fall to the school, however, to sell this idea to industry and to assist in mapping out a training program. When it is worked out completely, the pupil will be ushered into work in a scientific manner and be trained properly.

8. Economic and Social Adjustments

(a) *What the school can do:* If the school is able to create a right state of mind in a pupil, it has

gone a long way toward mapping out a successful career for him. The attitude toward people and activities may be the important thing upon which advancement hinges. This depends upon the thinking and conclusions of juveniles. Much can be done by a definite program of classroom work.

(b) *Socializing school and industry:* One of the specific things a teacher can do is to get pupils to see the various occupations in a correct perspective. It is wrong to let young people go through school with the idea that some jobs are intrinsically menial and therefore must be despised. A properly balanced education will engender within each one a respect for the other fellow and his calling. It is the function of the school to develop this democratic spirit, so that every honorable vocation will take on dignity in the eyes of boys and girls.

(c) *The school bank:* A common cause for concern among many thoughtful people arises from the spendthrift habits of Americans. Large numbers of young folks at work and in school are growing up with the careless habit of spending beyond their means. This is not a wholesome state of affairs. Habits of thrift should be inculcated early, and teachers can assist in this by starting a school bank. It is not the purpose here to discuss how this is to be done, but merely to suggest it as a feasible plan.

9. Seeing Industry as a Profession

(a) *Industrial training classes:* Society cannot expect to be safe from industrial strife and misunderstanding as long as men fail to take an interest in their work. The ideal condition would perhaps be for each one to be happy in his occupation. This may be a Utopian dream and yet it is the duty of the school to teach every pupil the value of the high calling he finally chooses. This should be kept in mind as a part of the function of the industrial training classes.

(b) *Economics and industrial science:* Just a word in passing to hint at the possibilities of some work in the fundamentals of economics and the science of industry. Many of the perplexing questions that beset workmen today would disappear if they could be taught a little about the economics of industry and production. If the average man could see behind the principles of industry, he would not be so susceptible to the influence of the demagog. Instruction in these matters may well begin before pupils leave for work and extend for a considerable period thereafter.

10. Building Morale

(a) *Status of juvenile workers:* It is too long a story to attempt to describe here the morale of the average juvenile worker. Neither is it the inference that his status is deplorable. There are certain things which the teacher should appreciate and understand about pupils, however, and one of these is the plasticity of youth. The young mind is not only pliable under the teacher's touch, but it just as easily moulded by contact with folks at work. This fact makes his entrance into industry an important event educationally.

(b) *Attitudes and judgments:* We have already touched upon right attitudes as an important thing and mention it here only to emphasize its significance in connection with morale. Judgment comes after thinking. Attitudes are the resultant of thought, and one's whole point of view depends largely upon his state of mind. The school and industry must come to recognize this important factor in the training of youth.

(c) *Type of teacher needed:* It is hardly possible to begin to picture the desirable traits a teacher should possess, without seeming to speak in platitudes, for all the good qualities should be possessed by those who are charged with launching young people into work. Those teachers who are leading pupils up to the threshhold of industry should be sufficiently conversant with occupations and workmen to act as guide and counsel. Suitable contacts must be made and kept with local employers, and correct interpretations are to be given to young people.

Conclusion: In all the discussion an attempt has been made to point out specific things that may be done for pupils, just before and just after they leave school for work. It has not been deemed necessary to prove that assistance and guidance are necessary, but merely to indicate how the job may be done. The vocational teacher has a large part to play in the entire program.

THE HOME JOB SHEET

E. F. Ferguson, Ferndale, Mich.

There is a great necessity for correlating the work of a household mechanics' class with odd jobs needed around the home.

The average person will summon a plumber, if the faucet leaks, an electrician if the door bell fails to ring, and a glazier if a window is broken. Does not the average boy take pride in doing something that will bring himself applause from his parents? He does, and with the thought that he will also receive credit at school will tend to greatly increase his interest.

Incidentally, by using the Home Job Sheet, the parents will become familiar with the work actually done by the students in the Shop.

The following form has given satisfactory results:

Lincoln Junior High School Manual Art Department

HOME JOB SHEET
Household Mechanics Class

Date....., 19...

Name.....

Grade.....

Suggestive Jobs: Glazing, plumbing, electrical repairing (bells, irons, toasters, extension cords), lock repairing, etc.

JOB.....

I. Was job completed (with, without) assistance?
II. Give time spent on job.
III. If a repair job, what materials were used?
IV. Tell briefly how job was done; giving each step.

To Be Answered by Parents:

I. Was job successful?
II. Workmanship was Fair, Good, Excellent (Underline).
III. Were tools and materials put away?
Remarks:

.....
Parent's Signature

.....
Instructor's Signature

Selecting Men for a Trade Education

S. G. Johndroe, Wentworth Institute, Boston, Mass.

PRACTICALLY all schools select their students by means of either an examination or certificating system. These are both good in their way, but they have two very grave faults which for certain types of schools are such as to make their use questionable if not inadvisable. They put too much responsibility upon the student's previous academic training, or they put all that responsibility upon the principal's judgment of the pupil's ability to profit by purely academic training. By academic training we refer to the training usually given in intermediate and high schools, which does not lead to specific and concrete ability to do something for which society is willing to pay. We would not in any sense condemn that training but we would point out that for the trade school that training in itself is of very little fundamental importance and for purposes of admission may have very little bearing upon the case. What the trade school is particularly interested in is the pupil's ability to profit by its instruction to such an extent that he may become an economic asset to his community and to himself. This the trade school insists will be shown immediately in his pay envelope and later by his position in his community. We do not wish to get away from culture, from a broader life, etc., but we wish to give to the student, first the means to that broader life.

To select, then, only those men who can qualify by previous academic training, is to perform an unjust act. Trades need greatly just those men whose previous academic training, because of family economics perhaps, has been sadly neglected. And these men above all others need the trade school.

Three Methods

The question then of just how to select men for the different trades from very poorly educated and apparently unskilled men is of vital interest to the management of every trade school. There are many ways which theoretically should work, but which in practice prove to be of very doubtful success. There is the so-called General Shop. Undoubtedly a very interesting experiment, it fails because it seems to the man or boy a waste of time. As an integral part of a large city school system, it gives good results. As a part of a trade school itself, it is out of place. The environment is very much against it. Boys will not work in it with patience when they can see their fellows working at a real trade and making progress at, to them, an astonishing rate.

Another very widely used method is that of the interview. Many large corporations use it for their apprentice schools. An interviewer with very sharp and piercing eyes gazes into the very soul of the youth and "sizes him up." We can find no official data on the success of the "sizing up" process, but we venture to predict that it is very good if it finds 75 per cent of its students at the job at the end of a year. To accept men for a tryout on such a basis would be a fairly good thing for a trade school to do, provided it allowed for two months of "following up" to see if the man fitted the job and vice versa, but to accept him definitely for a course on such a mere interview would seem an injustice to both man and school. Some men thus accepted probably should not be in a trade school at all. The interview method is good when based on a well-thought-out and well-checked questionnaire designed to do several very definite things, namely, to discover the following:

1. The student's interest and his sincerity.
2. The student's education and experience.
3. The student's knowledge of working conditions in the trade; its rewards and its promotional probabilities; lines in which promotions may occur.

The Questionnaire Method

The above three points seem to us to be the limits of the questionnaire method. Point number 1 will be very difficult to discover and will require very persistent questioning; point number 3 will be found to be quite indefinite and will require the giving of a good deal of definite information on the part of the instructor. To admit any student into a trade course on the basis of a questionnaire alone would seem to be an experiment at best and one that does not really get at either the student's abilities or the job's requirements. Both require a much more careful and detailed analysis.

The following questionnaire is given as a good one to start with, but had best be revised yearly to secure a better type of question. It has been gotten together by taking what we think are the best questions from several that are in use at the present time.

Application for Course in.....Received.....
Acknowledged by Date

.....
Name of course Initials

Name in full.....
First Middle Last Date

Home Address .....
Age..... Height..... Weight..... Nationality.....
Any physical defects.....
Father's Business .....
Years in High School..... Did you graduate..... if so in what course.....What subject in school did you most enjoy?.....
Why? .....
If you left school without graduating why did you do so?
.....
What books or magazines have you read during the past year?
.....
What have you ever done to earn money?.....
How many jobs have you worked at since leaving school?.....
Describe something you have made or done.....
Describe on the back of this sheet some piece of apparatus you have seen. Make sketches if you like.
Why do you choose this particular course?.....
What athletic teams have you played on?.....
To what societies did you belong in school and to what societies do you belong now?.....
What offices did you hold?.....
How do you spend your evenings?.....
Would you have to work outside of school hours to pay your way in school?.....
Rating of interviewer.....Best fitted for.....Course

Information Which Should Be Given

In the interview there should be an attempt made to analyze the occupation, which it is best to do frankly for the applicant. Many boys and even men know very

little concerning the trade for which they are applying. They should have all possible information concerning it from a reliable source and in all its aspects. The analysis of the job should always precede the analysis of the man who is to fit into it. This work should be very carefully done by men who are familiar with it, but aided by some one trained to analyze it from the mental as well as physical point of view. Every job, for which training is necessary, requires both mental and physical abilities on the part of the applicant for it. Many require social abilities as well, which it is the duty of the school to bring out and develop by its training. This last will be very largely determined later by what is so often called "school spirit" but which in the main is but the development of its pupils' ability to work together for the common and individual good. The following job or trade analysis blank may be suggestive:

Trade .....
Machines to be mastered.....
.....
Hand processes to be mastered.....
Kind of work, Heavy.....Light.....Medium.....Numbers of pieces to be handled daily.....Lifting.....Hauling.....
Climbing..... Sitting..... Walking..... Kneeling.....
In awkward positions.....Clean.....Dirty.....Hot.....
Cold.....Ability in English, Read?.....Write?.....
Spell?.....Talk?.....Grammar?.....
Ability in Mathematics, Copy figures.....Add.....Subtract..... Multiply..... Divide..... Fractions.....
Decimals..... Proportion..... Formulas..... Trigonometry..... Logarithms..... Ability to memorize and obey directions.....Ability to observe and retain, to visualize.....
Ability to draw or interpret drawings.....Ability to Measure accurately.....Eye sight required.....

The above is taken largely from Link's Employment Psychology but has been changed to fit more closely the needs of a trade school. Since men have filled the trades thus analyzed since their beginning, there must be human qualities or abilities which correspond very closely to those demanded by the job. It is but necessary then to bring the right human beings into connection with the job, and we have done a great deal toward making contented and efficient workmen. The general qualities of industry, good workmanship, a feeling of responsibility to society for a good job, etc., are so general that psychologically we cannot test for their presence in a given individual in any other manner than by means of the job itself. These very general qualities can best be separated into their component parts and the parts tested for. The school is interested in developing them in the individual, not in finding them already developed. They bear about the same relation to particular abilities as that borne by general intelligence to particular kinds of intelligence. The trade school can have but little use for general intelligence, for the reason that it is not specific enough to become an index for placing men where they belong.

Some Tests for Specific Trades

One rather significant witness of an applicant's attitude toward good workmanship may be obtained by carefully noting the manner in which he executes all tasks which he is asked to perform. In the case of the application blank or questionnaire this may mean merely considerable clerical experience or none whatever. Care is essential to good workmanship and, whenever that is found, it may well be assumed that in that kind of task the man is to be a good workman. Actions speak much louder and much more truly of a student's character development than anything else can ever speak. Our tests then should usually be of such a kind that they may require action under competent observation and along the lines suggested by our job analysis, always bearing in mind, however, that we are looking for a possibility and not for an actuality. We cannot judge of the man's mental capacity by looking him in the eyes or by observing his "bumps." We must place before him both mental and physical problems for solution and judge by the answers he gives as to his mental and physical abilities. These problems must not be based upon previous academic training, but upon fundamental mental and physical abilities possessed by every man in varying degree. This degree will probably determine just what trade it will be best for him to attempt and enable us to give him an idea as to his probable success or failure.

For example, the outstanding abilities of a physical kind needed in a machine worker seem to be:

1. Good eyesight.
2. Good general health and a fairly strong body.
3. Ability and liking for indoor work.
4. Mechanical ability, especially with iron.

An eyesight test with the Lowell chart is of the greatest significance in picking men for the machinist trade chiefly because accurate measurements are so necessary throughout the man's entire service. It is of especial importance as they progress and become tool makers. Items Nos. 2 and 3 of the above qualities can best be discovered through the interview. Of course good general health can be discovered by a physical examination, but we will find, we believe, that the word of the applicant and the intelligence of the interviewer will be nearly as reliable and will not take up so much time.

The best test for mechanical ability which does not require either a high general intelligence quotient or good previous education is probably the Stenquist Mechanical Assembly Test. Not that we do not desire a high I. Q. or good previous education, but the fact is that they are not essential in a good machinist. To require them would be to be unjust to many boys who are capable of becoming machinists without them. We admit that they would probably become much better machinists with them, but we can hardly hope to secure everything. We confess that we would like data as to the average I. Q. essential for the machinist's trade, but we have been unable to find them and have had no time for an investigation of that kind and scope.

The Electric Wireman

The Stenquist test has a very high correlation with success in many kinds of shop work. Tooks figured it with boys and girls of around 16 years and found it to be 75. Probably it will predict much more accurately for electric wiremen than it will for the machinists, since the wiring trade from its physical side has come to be an assembly of already manufactured parts.

The mental qualities desirable in applicants for the machine shop may be listed as follows:

1. Reasoning ability concerning things.
2. Ability to follow simple directions well and exactly.
3. Ability to visualize and remember well.
4. An accurate judgment of form.
5. Mental alertness.

The above abilities are not peculiarly desirable in the machine worker alone. They might be desirable in a dozen trades or in many businesses. They must be found, however, in the boy who hopes to become a machinist of the efficient and able kind. The usual written examination never discovers them directly. Mathematics for entrance to a machine work course is not essential because of the fact that all the mathematics necessary for the shop, drawing room, and applied science laboratory, can easily be taught during the course and much more rapidly than it can possibly be used. This is true of every course in a trade school. Such mathematics should be given in very much of a shop atmosphere with the idea of its application ever in mind.

Reasoning ability can be tested by some such simple problem as that given below. Present a picture of two gears in mesh, one having twenty teeth and the other sixty. If the first turns six times how many turns will the second make?

The second quality, the ability to follow simple directions well, can be tested by the Easy Directions Test. A very large number of students are deficient in ability to even remember orders given, if they are at all complex. Such a test is given in Link's Employment Psychology on page 411. This will take little time and should be given to every applicant for a trade school course. This ability is very necessary for the success of every workman.

The ability to visualize and remember well can easily be tested by having ten simple objects in a drawer and giving the student a chance to look them over for a definite time, say for one minute, and then requesting a description of the objects seen. The matter of scoring will be easy and will lead eventually to a definite standard for this course. The objects may be made fewer and a sketch required if time is allowed instead of the oral description. In this case the scoring should be done with reference to both good workmanship and power to visualize. We do not mean the good workmanship of an accomplished draftsman but that of one who seems to care to have his results resemble the original as much as he can possibly make them. The mental attitude here is of the greatest importance as it usually is in beginners.

For testing the fourth quality, accurate judgment of form, a rather difficult form board should be used, containing angular and irregular pieces rather than one having all circular pieces. It is so very necessary for the machinist to note slight differences in size and shape in all his work, that this is a very important test and its scoring should be figured out accurately and its correlations with good shopwork carefully followed up for some time.

The quality of mental alertness is of importance in any trade in which machinery is used. It is also of great importance in all the building trades save perhaps that of plumbing. In many cases it is necessary to preserve life itself. The Mental Alertness Test devised by the Scott Company, consultants and engineers in industrial personnel, is a good test for the presence of this trait in applicants.

For the class in electric wiring, using the same trade analysis blank, we find that the applicants should have the following physical qualities:

1. Fair eyesight.
2. A strong and active body.
3. Ability and liking for either outdoor or indoor work.
4. Ability to assemble parts rapidly and well.

Their mental qualities should be:

1. Reasoning ability concerning ideas and things.
2. Ability to follow directions well.
3. Ability to visualize and remember details.
4. An accurate sense of form.
5. Mental alertness.

The above qualities are essential on the electric wiring job because the man must climb, sit, stand, kneel, or work in awkward positions. He must endure either heat or cold and must be able to assemble large numbers of complicated parts in a small space and frequently by feeling alone. He must have good reasoning ability concerning things and principles that he may understand the machinery and currents for which he is wiring. He must be able to understand complicated wiring diagrams that he may carry out the plans of the engineer with all speed, economy of material and labor, and with accuracy. He must be mentally alert that he may know at all times the danger which is but a few inches from him. Many electricians are killed annually through lacking in care or in alertness or through ignorance of the ways of electricity.

The above qualities can readily be tested for in much the same manner as for those of the course in Machine work: for quality No. 1, the Lowell Chart; for qualities Nos. 2 and 3, the interview; for No. 4, the Stenquist Mechanical Assembly Test.

Mental abilities may be determined: For No. 1, the Thurstone Reasoning Test; also the results in the Stenquist Mechanical Assembly Test; for No. 2, Easy Directions Test; for No. 3, same test as for machine workers, (drawer with simple objects); for No. 4, the more difficult triangular form board (not so important as for machine workers); for No. 5, Mental Alertness Test.

We should have a more active mental and physical specimen for this course than for the machine work course. Otherwise the men may be made the same and with equal chances for success.

(To Be Concluded)

Automotive Essentials

Lubricating the Engine—II

Ray F. Kuns, Principal Automotive Trade School, Cincinnati, Ohio

Other Splash and Circulating Systems.—Splash and circulating is the simplest form of automobile lubrication which is practical. The chief differences between the Ford System and others is in the method of circulating the oil and in the oil sump and the second or upper oil level. The sump is the lower or first oil level. Oil in the sump varies in the level it reaches as it is used by the engine or lost from the pan. The engine needs approximately the same supply of oil at all times. Lubrication must be positive. Rods dipping a slight distance one second and a greater distance the next is not practical. The lower level then is allowed to vary since the rods do not dip into it. The upper level is the upper pan and more particularly the troughs which may be in the upper pan or merely fastened into the single pan. The Dodge in Fig. 5 shows the second level. Fig. 10 shows oil on both levels.

Oil pumps of various designs are depended on to lift the oil from the lower level and distribute it to the engine parts, and fill the troughs for the connecting rods. These are discussed at a later point. Any type of pump will develop pressure to force the oil against gravity. Feed is therefore more positive, if the pump is maintained. If the pump fails the system fails. Fig. 5 shows how the connecting rod on No. 3 throw of the crankshaft dips into the pan trough. This figure also illustrates the slots of the upper level which allow the surplus oil to drain through to the sump. Fig. 6 of one model of the Buick illustrates a single pan in which are fastened six troughs for the oil. In this instance the oil pump is carried in the rear end of sump and driven from the engine. It

FIG. 5. DODGE OIL PAN AND SUMP WITH CONNECTING ROD TO CRANK SHAFT IN POSITION.

picks the oil from the sump and forces it through the tube to each of the troughs. From these points it is thrown or splashed by the rods to the other engine parts.

There are many variations of the splash and circulating systems. In some instances the main bearings

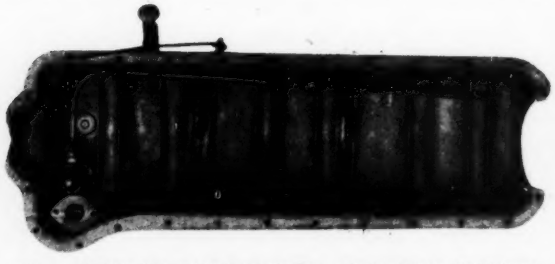


FIG. 6. BUICK OIL PAN AND PUMP. INDIVIDUAL TROUGHS ARE MOUNTED FOR THE CONNECTING ROD TO DIP INTO AND SPLASH OIL.

FIG. 7. OIL PANS FOR A FACE FEED OILING SYSTEM. PAN "A" IS THE LOWER LEVEL OR OIL SUMP, AND PAN "B" IS THE UPPER PAN AND ACTS TO CATCH AND RAIN THE OIL INTO THE PUMP.

may be supplied with oil fed to them with tubes. These tubes may merely drop the oil into pockets over the bearings, or they may be connected to the bearings and some force be available. In the latter instance the system would be force and splash. Wherever the rods are made to dip into oil pockets or troughs, the system may be said to be circulating and splash, thinking of the larger classifications of the systems.

Force Feed Systems. — These systems vary in the completeness of the forcing of the oil to the parts to be lubricated. A full force feed sends the oil under pressure to each rotating part of the engine. In all cases the sliding parts such as the pistons, rings, valves, etc., depend on the oil vapor thrown off by the moving parts and in this sense are partially lubricated by splash. In order for a

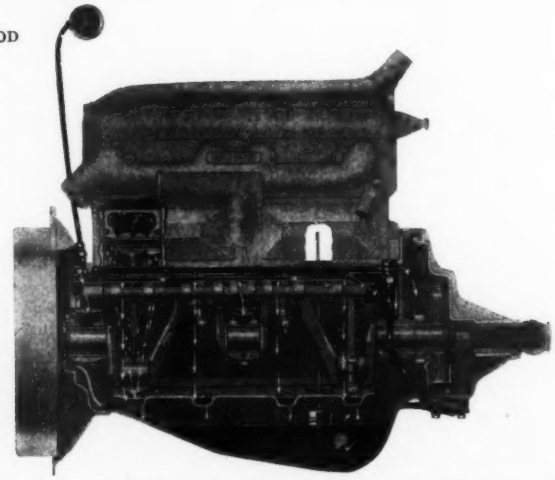


FIG. 10. CIRCULATING AND SPLASH OILING SYSTEM ON DODGE BROTHERS ENGINE.

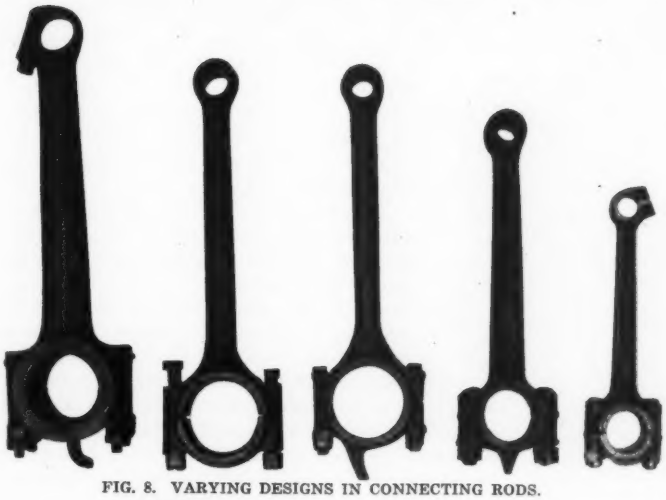


FIG. 8. VARYING DESIGNS IN CONNECTING RODS.

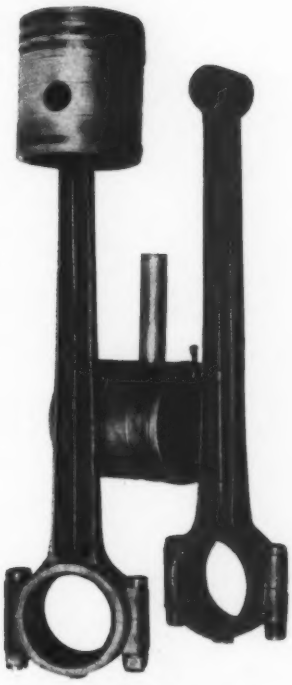


FIG. 9. CONNECTING RODS FOR A FULL FACE OILING SYSTEM. TUBES ON THE RODS CARRY OIL TO THE PISTON PINS.

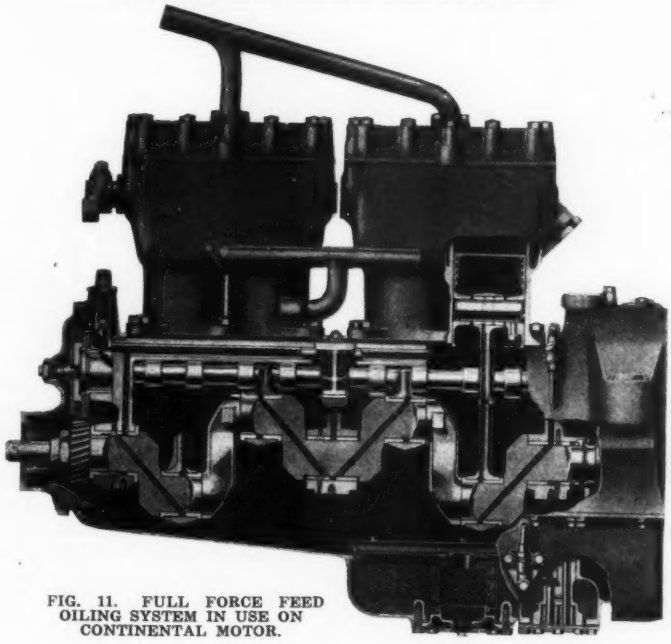


FIG. 11. FULL FORCE FEED OILING SYSTEM IN USE ON CONTINENTAL MOTOR.

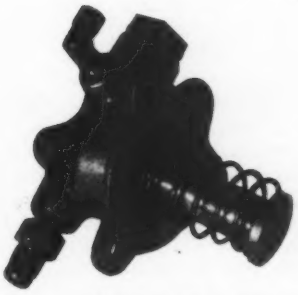


FIG. 14. PLUNGER TYPE PUMP ASSEMBLY.

system to qualify as force feed it must have force feed to at least the mains and through the crankshaft to the connecting rods. In order to qualify as full force feed it must carry the oil from the connecting rod bearings to the piston pin bearings in addition. The most noticeable difference between the splash and circulating and the force feed is the absence of any pockets or troughs in the upper oil level. In fact, the place occupied by the upper oil level pan in the splash and circulating is oftimes occupied by a screen in the force feed. Or if a pan is used, it is only to catch and drain the oil to the lower level and prevent the oil in the sump being splashed by the road sway of the car, into the upper level and thus onto the moving parts. Fig. 7 illustrates two pans from a job where force feed oiling is used. The upper pan has no grooves. It is provided with two holes covered with screen or wire strainer gauze to allow the oil thrown off unused, from the revolving parts, to be collected and drained back into the lower sump. From the lower sump a gear type oil pump picks it up and forces it into the mains, from the mains it goes into the crank and thence to the rods. Oil not used in the rods is thrown off and serves to lubricate all other parts just as in splash and circulating.

Connecting Rod Design for Lubricating Systems.—Connecting rods have an all important part to play in the success of the lubricating system in all engines. The heavy rod in the left of Fig. 8 was designed for, and served, in an engine with splash and circulating lubrication. The dipper appearing under the center of the cap is a short length of copper tubing run down to dip into the oil. It is turned with a curve at the lower end so that it strikes the oil in the trough with the open end, thus forcing the oil up through the tube and into the bearing where it is conducted through grooves over the surface of the journal. The second rod has no dipper. It was used in a force feed system. The forced circulation stopped within the connecting rod bearing. The center rod was used in an engine having a splash and circulating system. It has a dipper bent with a hook. Where the hook is joined onto the cap a hole is drilled

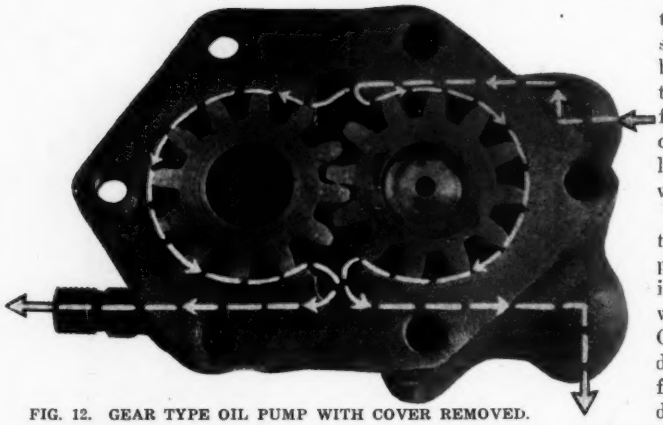


FIG. 12. GEAR TYPE OIL PUMP WITH COVER REMOVED.

through the cap. Oil struck by the point of the dipper follows upward along it and thus through the hole into the bearing. The next rod utilizes a dipper but no hole is drilled into the cap. Oil splashed upward by the dipper falls onto the shaft and rod and thus finds its way into the bearings as well as lubricating other parts of the engine. The small rod on the right utilizes the bolts for dippers or strikers and bearings have no grooves. The mist or spray thrown up by the rods serves to lubricate all parts of the engine.

In Fig. 9 is shown a pair of rods taken from a car using full force feed. The small tubes on the webs of the rods serve to conduct a supply of oil from the connecting rod bearings up to the piston pin bearings and then through the piston pins to the cylinder walls. Lubrication of the cylinder walls is doubtless of two types—some from the pin through the crankshaft and rod tubes, and some thrown off from the rod bearings.

Splash and Circulating Illustrated.—The cut of the Dodge engine shown in Fig. 10 is offered to illustrate the path followed by the oil in the lubrication of an engine where this type of system is used. Other jobs vary in minor details but a proper idea may be gained from a careful study of the illustration. Oil is drawn from the sump by means of the pump at the forward end of the oil pan and which is driven by the spiral gear on the crankshaft. From the pump it is forced through a tube to the roof of the crank case housing. The tube has holes drilled in it and from these holes oil flows in streams to fill the pockets over the cam shaft and crankshaft bearings, and the constant level oil troughs in the second or high level pan. The rods striking the oil in the troughs throws it onto all other parts of the engine. A special supply of oil is run into the timing gear compartment to lubricate the timing gears and the motor-generator drive chain. Surplus and unused oil is drained from all points to the sump and recirculated.

Full Force Feed.—Fig. 11 is a cut of a Continental heavy duty motor. Oil is carried in the sump. From the sump the gear type oil pump forces it into tubes. These are connected to the main bearings. Oil at a pressure up to fifty pounds per inch is forced into the main bearings. It flows in grooves and some is used to lubricate the bearings at this point. A good portion of the oil goes into the crankshaft, from the grooves of the mains and flows through the shaft to the connecting rod bearings. The journals for these bearings are fully lubricated and the excess oil is either thrown off to splash lubricate other engine parts, or follows the grooves into the connecting-rod oil tubes and thus to the piston pins and from them through the piston pins to the cylinder walls. The dotted lines indicate the path followed by the oil through the passageways and tubes provided. As stated previously, the cam shaft bearings may be fed under pressure or they may be splash from the rod bearings. This will vary with manufacturers. The mist or spray of oil within the crank case is depended on for tappet, or valve lifter lubrication, and for the lubrication of the valve stems.

Gear Type Oil Pump.—This type pump will throw a good stream of oil under considerable pressure. The pump shown in Fig. 12 has been in use for a number of years. It shows slight wear. Arrows indicate the path of the oil. One gear is driven, from the engine, the other is driven from the first. Oil drawn into the pump follows around the outside edges of the gears and does not pass between them. As a result each tooth carries ahead of it a pocket of oil. Coming around the gears from each side the oil meets at the center and is forced out to the tubes and engine. The meshed teeth prevent the return of the oil between the gears.

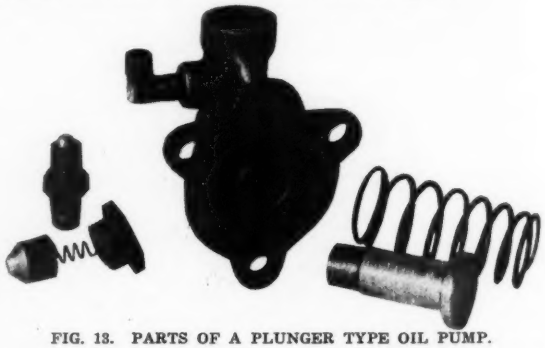


FIG. 13. PARTS OF A PLUNGER TYPE OIL PUMP.

Plunger Type Oil Pump.—The plunger type pump is perhaps the easiest to understand. It works much the same as any pitcher or cylinder pump used to draw water. On one stroke of the plunger oil is drawn into the cylinder and a check valve closes after it. When the plunger changes direction and comes upon the oil in the cylinder it forces it out into the oil lines of the engine past another check valve. This valve closes when the plunger moves on suction stroke and oil is again drawn from the sump and then when the cylinder is filled again it is forced out into the oil lines so that a rather constant stream of oil is flowing. See Figs. 13 and 14.

"MY LIFE WORK"

Under the above caption a notable series of pamphlets for vocational information and guidance has been issued by the Milwaukee Vocational Schools. The monographs are directed to the part time students enrolled in the schools and deal with sixty leading occupations which afford opportunities for advancement and livelihood in the city of Milwaukee. Among the trades represented in the series are electricity, painting and decorating, plastering, molding and coremaking, pattern-making, machine shop practice, tool and die making, drafting, sheet metal work, forging, welding, boiler making, plumbing, bricklaying, carpentry, etc.

Each monograph is based on studies of local industries and occupations and presents to the prospective worker definite information on: (a) the importance of the occupation; (b) the operations, tools and materials of the trade; the conditions of work; future possibilities in the occupation; (c) what is necessary to enter the occupation; (d) promotional possibilities and educational requirements therefor. The pupil is given a very clear view of the whole occupation and of the future which it presents.

The monographs have been prepared from material gathered by the various instructors in the school. The immediate work was done by Mr. Harry S. Belman, under the direction of the chief of the Division of Vocational Teacher Training and Research, Mr. Robert H. Rodgers.

Exhaust System as a Class Project for Sheet Metal Trade Classes

Harry E. Andersen and John F. Faber, Erie, Pa.

The presence of sawdust in woodworking shops, where machine work is carried on, is both insanitary and unnecessary. Most commercial shops who have this problem to contend with, install exhaust systems, whereby the shavings and sawdust are conveyed from the machines to the boiler room for consumption in the boilers.

The advisability of such a system in large school shops is unquestionable, for it not only safeguards the health of the students but lessens the possibility of accident by keeping the shop free from flying dust, and the floor space around a machine free from piles of sawdust and shavings. The time and labor saved in clearing the floor is another valuable feature of an exhaust system.

In view of the foregoing, the accompanying plan for the exhaust system made and installed by the second year sheet metal trade class, at Academy High School of Erie, may be of interest to others who contemplate such a system. It was constructed in sections in the sheet metal shop under the instruction of Mr. C. H. Derby and Mr. H. E. Andersen, instructors in sheet metal drafting and construction. The variety of layouts and practical erection experience gained from the undertaking made this project a valuable one for the trade students in the class.

Planning the System

A blower or exhaust system starts with *hoods* or covers over the source of the sawdust or shavings. These hoods are connected to *branch pipes* which are joined to the *main pipe* of the system. The main pipe terminates at a *separator* or *collector* which separates the sawdust or shavings from the air in which it is carried, and deposits it through another branch pipe to the furnace where it can be consumed by fire. At a convenient place between the last branch pipe and the separator, a motor-driven *fan* is placed to create the suction of air, which operates the system.

The ideal method is to have the system empty directly into a boiler or boiler hopper for consumption. If this method is used, a provision should be made to deposit the refuse in a storing space, when the boiler is not running,

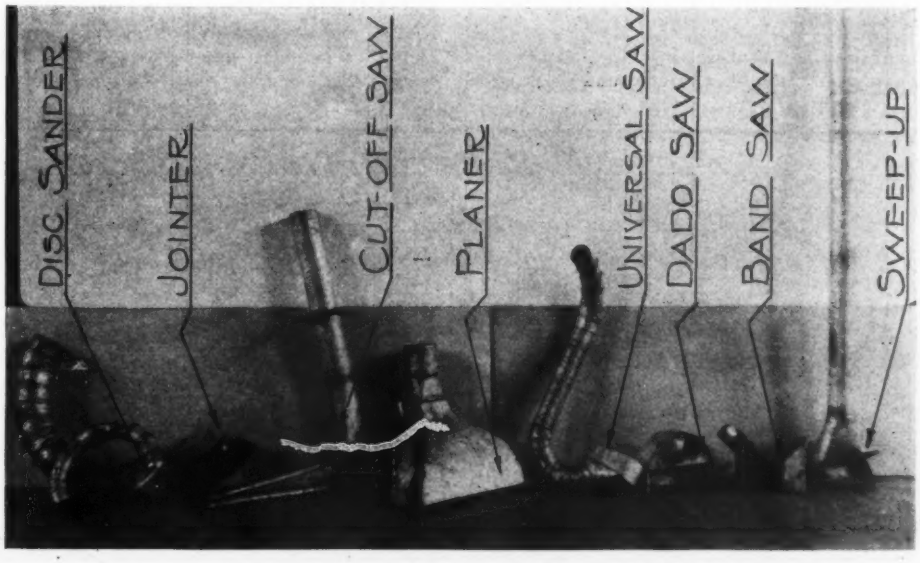
BOYS PUTTING UP THE PIPING.

which is the case in school buildings during the spring and early fall months.

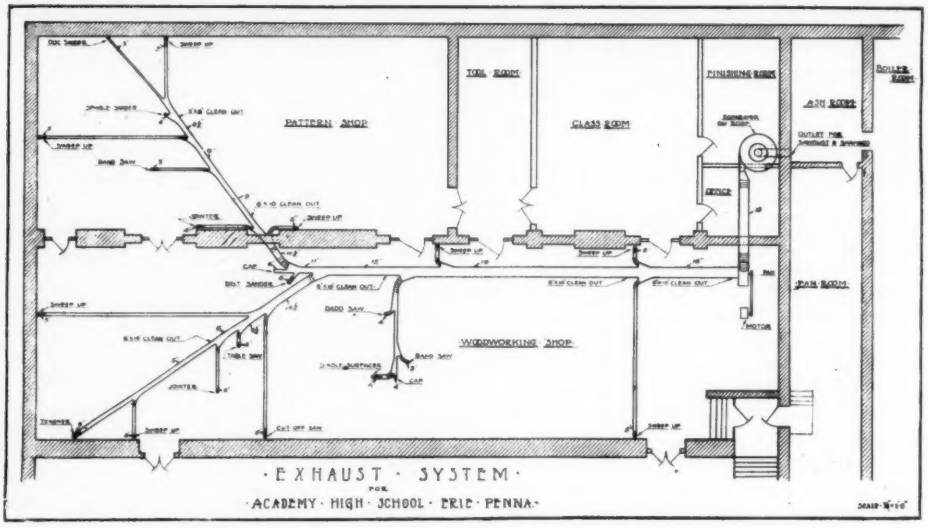
In our case it was thought best to end the system in the ash room adjoining the boiler room.

Hoods

One of the important features of an exhaust system is the design of the hoods. The designing of hoods requires trade experience and good judgment to give the proper consideration to the amount and direction of saw-



FITTINGS AND HOODS WHICH THE STUDENTS MADE.



FLOOR PLAN OF THE WOOD SHOPS SHOWING THE EXHAUST SYSTEM.

dust as it leaves the machine. Hoods should be well tapered and should leave the machine with an easy streamlike curve in the direction taken by the sawdust or shavings.

Hoods should be entirely free from "pockets," or abrupt bends, as these greatly decrease the efficiency of the system. The hoods should be constructed so that saws or knives may be removed without difficulty. This is particularly true when stationary hoods are used. If removable hoods are used, telescope joints should be provided to allow removal without difficulty. Hooks and rings should be provided to hold the telescope joints in place when raised. The manufacturers of the machines to be hooded may suggest ideas which assist in solving the problem. The accompanying cuts show the hoods designed for the machines in our shops.

Branch Pipes

Branch pipes are run from each machine which creates any great amount of sawdust and from a number of places on the floor next to the wall in a clear space, or along a center post. These floor inlets are intended to take care of sweepings from the floor and are called *floor sweeps* on the plan.

The size of the pipes from each machine is determined by the size of the machine, its capacity, and the kind of wood worked upon. Here, the manufacturer of each type of machine will specify the size of branch pipe necessary to care for the machine. A pipe five inches in diameter is sufficient to care for the floor sweeps in most school shops.

These pipes should not rise too abruptly from the machines to the main pipe and should take up no more floor space than is absolutely necessary. Wherever possible the pipes should run along the wall or ceiling to provide the maximum amount of head room.

Branch pipes should be connected to the hoods so as not to interfere with the working and handling of lumber.

Blast gates should be installed in the pipes from each machine, within reach of the operator.

Main Pipe

The number and sizes of the branch pipes determine the size of the main pipe. The method usually employed to determine the area of the main pipe is to add from fifteen to twenty-five per cent to the combined area of all branch pipes. For instance, in the accompanying plan there are twelve branch pipes with a combined area of 187 square inches. Add 25 per cent for the loss caused by friction and the total area of the main pipe is 233 square inches. When blast gates are used, as is the case in our system, the floor sweeps are not considered in computing

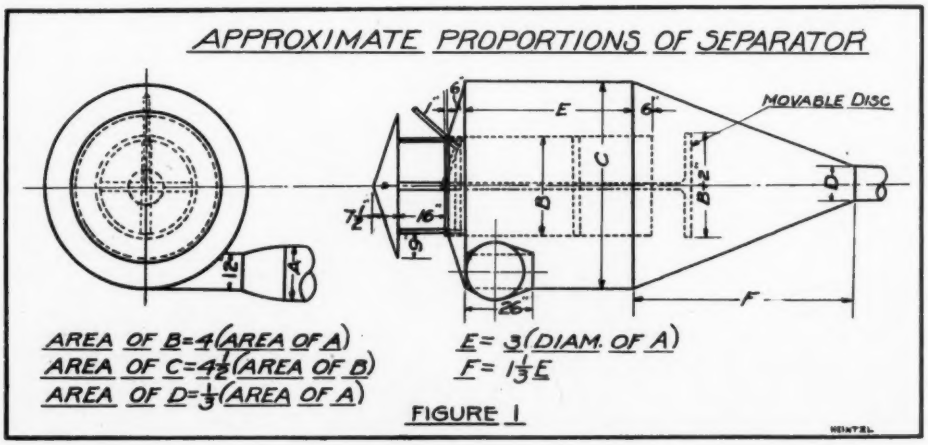


FIG. 1. DETAILS OF THE SEPARATOR.

the size of the main pipe. To take care of the future addition of machines it is best to make the main pipe a little larger than figured, hence in our case the main pipe was decided upon as eighteen inches in diameter.

The main pipe should be located at least eight to ten feet above the floor line to conform with the "Underwriter's Rules and Regulations." This distance provides ample head room and permits the easy handling of stock lumber. The pipe should be located as near as possible to the center-line of work distribution. For instance, it should not be placed in the center of the room if most of the machines are located on one side, but should be placed so as to have approximately the same amount of work to perform on either side.

The pipe should be as short, straight and as free from elbows as possible. Wherever a bend is necessary, it should have a center radius of not less than one and one-half times the diameter of the pipe at the bend.

The pipe layout should be made with provision for frequent cleanouts, so that ready access is possible in case shavings clog the line.

Separator or Collector

The size and construction of the separator can best be shown by Fig. 1. It is a centrifugal collector of ordinary cyclone type. It is of liberal proportions as shown by the computations.

In the center of the inside is a disc which can be raised or lowered without opening the collector. The height of the disc is adjusted to suit the kind of material handled and the proper separation of air. Care must be taken so that back pressure on the fan does not result from poor adjustment, which would tend to *clog the line.*

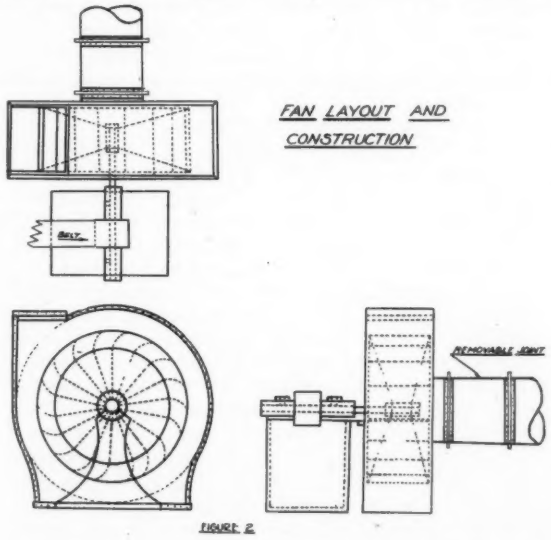


FIGURE 2

The separator supports were made of 2½" angle iron, well braced. These are of ample strength to withstand the weight of the separator and any additional stresses due to wind and snow.

The separator serves its intended purpose to good advantage if placed upon the roof of the building, not too far distant from the branch pipes. This insures the ready escape of the exhaust air and a strong force of air through the pipes, which is necessary for the highest efficiency.

Fan

After the sizes of the pipes and separator have been determined, the size of the fan sufficient to create the desired suction and force of air must be considered. For this purpose, the manufacturers of fans have prepared a

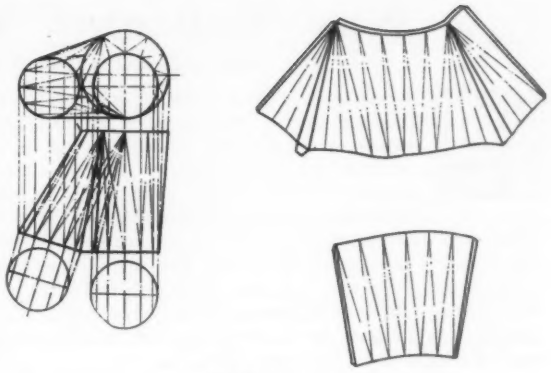


FIGURE 3

table to suit various forms of exhaust systems. These firms are always ready to furnish the number of the proper fan and recommend the purchase of a motor of suitable horsepower to operate the fan successfully. Two companies who are helpful are the Buffalo Forge Company, Buffalo, N. Y., and the B. F. Sturtevant Company.

With our system we used a No. 45 fan with an area of 190 to 250 square inches. The motor in use is a 7½ h. p., G. E. type, having a speed of 695 r. p. m.

The construction of the fan is illustrated in Fig. 2. The fan is connected to the main pipe by means of a removable collar which, when loosened and slid back on the pipe, leaves an adequate inspection opening between the end of the main pipe and the fan inlet.

Connections

No more elbows than are necessary should be used throughout the system. Wherever a branch or tee joint must be used, it should be well tapered, as shown in Fig. 3. This allows a free discharge of the sawdust or shavings into the main without interfering with the current of air in the main. This tends to eliminate the restriction caused by a connection.

Elbows should be made of iron at least two gauges heavier than that used for the pipes of same diameter, because all elbows cause more or less friction and consequently wear out quicker.

Pipes should be well braced at short intervals. If only a few of the machines are in use at one time, one or more caps at the end of the lines may be removed to provide air enough to keep the main pipe clean. The main line, fan, and separator should be connected in the order named for the best results. The hoods should not be connected to the line until the fan is ready for operation. to prevent the hoods from filling up with sawdust.

A GRADE POSTER PROJECT.

Why "Daltonize" Vocational Education?

F. L. Allen, Principal, Arthur Hill Trade School, Saginaw, W. S., Mich.

OUR superintendent had been in attendance at Harvard during the summer of 1923 and while there heard considerable discussion of new methods in education. In a certain class of school administration much was being done among educators, in search of a "way out" in plan and system salesmanship. During that summer the Dalton Plan and Miss Parkhurst made a personal contact with the class, expounding her theory with a great deal of enthusiasm and much success. This was the actual beginning of an experiment tried later that year at the Arthur Hill Trade School.

The Saginaw Situation

We have in Saginaw, Michigan, which is located just on the edge of the automobile center of the world, a trade school which for the past fifteen years has been pioneering in the field of industrial education. Our school is separate from the rest of the school system. It is housed in a modern fireproof building designed as a trade school, and in this building we teach drafting, patternmaking, machine shop, electricity, motor mechanics, printing and related subjects to tenth and eleventh grade boys of our city. The offering for girls is a two-year course in home economics and the grades are the same as for the boys. The part-time school and evening classes bring our yearly enrollment up to about six hundred. A staff of fifteen teachers can nicely take care of this number distributed as they are.

This type of school, not bound down by tradition or hampered by other educational red tape and customs, offers a wonderful opportunity for experiments, either for the benefit of the student or the teacher, as the case may be. Here we are open minded and work on the theory that we will try anything once if it offers any possible improvement in our present organization.

Now the purpose of this article in the Industrial Arts Magazine is simply this:

We tried the Dalton plan of individual instruction at our school.

We used it eight months.

We returned to our old type of instruction because—

Now for the Dalton "fans" who do not want to hear their pet educational scheme exploded and exploited, my advice will be to stop reading at this period. For the people who know of the Dalton plan from a question mark standpoint, I believe I can show a few of the "what might happen" and a lot of the things that "will happen" in a school that undertakes to organize under this plan. (Experience is the one method of instruction that has stood the test of time.)

Get this straight before we start. Our school is not of the "lock-step" type (whatever that is). Our pupils do not march out of the building at dismissal with a left-right, left-right beat to the tune of a hickory stick. We do not treat or teach our pupils collectively. In going down the list of objections and weak points of present-day education raised to promote the Dalton plan, I find but few objections that apply to us. Being organized as we were and at the suggestion of the superintendent, the teaching staff in 1923 took up an exhaustive study of the Dalton Laboratory plan.

How the Plan Was Introduced

The method of approaching our teachers in a way was interesting and this part of the plan was successful. First, I discussed with some of the stronger progressive and resourceful teachers of our building the Dalton plan. The teachers became interested. I talked the plan over with more than half the faculty and, when I found I could depend upon them for support, I called a teachers' meeting, laid my plans before them, and announced that we would start operation under the Dalton plan beginning the second semester. It was decided to get our work in shape so that we could start all students off with a "clean slate". The teachers were told to bring up-to-date all work under the old system and prepare for the new. This meant study. The plan was presented in detail and in all we spent a couple of months in preparation before the second semester started.

A new system of daily and monthly record cards was printed in our shop. Advisor cards were worked out and sample assignments or contracts were written by the teachers and tried out on the students without their knowing what it was all about. A couple of teachers wanted to resign when they began checking up on all the detailed records and individual tests that would have to be given and be necessary for success under the new system.

Here seems to be one weakness in modern education or rather the general plan. Present-day organization is attacked as lacking in its ability to function while normal school and teacher training centers pass by uncriticized for their inability to produce teachers who have the fundamental requisites of successful teachers. The field of vocational education is left upon its own resources in picking and developing teachers of subjects which are new to the public schools. From my own experience new teachers in our work have only about a fifty per cent chance of measuring up to all the demands made of vocational men and women. However, this leads me away from the educational Niagara I started to apply to a trade school.

The Work is Begun

On the first Monday morning of the new semester an assembly was called and the laboratory plan was explained with much patience. The boys and girls seemed very pleased. Possibly they saw the back door unguarded, perhaps it was the novelty of the thing that appealed to them, maybe a few agreed with me that it would be a real test of initiative, judgment, and responsibility. The budgeting of their time seemed to bring out the popular teachers. One teacher said he liked the system because his week's work was crowded into the last two days. All of this was expected and had been guarded against. We tried to cover all possible avenues that might lead to failure. Groups were assigned home rooms where discussions were brought out by the teacher. Students met here each morning for ten minutes, after which time they were at liberty to go where they pleased and when they pleased. The one requirement was that the academic work be done in the morning and the shop work in the afternoon.

Complete sets of job sheets were worked out by the teachers, and the school secretary became a mimeograph operator. Each student contracted to do a certain amount of work for every week, and these contracts were based on the amount of work the average student could do in five days. It was thought best to break the total monthly assignments up in these small units, thus the reason for making the assignments as we did. After the plan had been in operation a short time, we worked out assignments for the A, C, and D students in each subject taught. Students were given a work card, as the reproduction here will show. These cards were to replace the old traditional report cards and were to be carried at all times. When a

contract was finished, a check was put in the space opposite the subject completed. In this way the students had a weekly check on their work. Teachers checking work the first of the week were supposed to counsel students in work in which they were falling behind.

A master chart was placed on the bulletin board of each room, and students could check their progress with other members of the class. This assisted the retarded students in gettting help from those making rapid progress. Teachers had a special work card for each pupil and, as the students put in time, they checked the work done and the time spent on the subject. This helped the teachers when the final check was taken and the individual tests given. These check-ups were given as soon as the boys and girls finished their contracts.

In all we were operating as nearly as possible under the Dalton plan, as outlined by Miss Parkhurst. One of the teachers maintained that we had swallowed the bait, hook, sinker and all. We even went so far as to get Miss Parkhurst to address our teachers. After her lecture, the content of which is all in her book, the meeting was opened for questions and discussions. Believing that the exponent of such a cure-all plan would be willing to break down a few objections that had been raised in the minds of our teachers, they began asking questions which were all answered in a crisp manner which seemed to cut into the crust of favor that had been growing about the plan. After the teachers, in search of more working detail, had been sufficiently squelched for breathing any objections to the idea, the meeting broke up and Miss Parkhurst left the city.

Thus did the originator of the plan bring about a feeling of discontent among our teachers. This discontent later grew by such leaps and bounds that I, acting as their administrator, was forced for the sake of peace and harmony to return to the old and much abused organization.

Right here I suppose this question is asked, "Do we run our schools for the pupils or the teachers?" My answer to that question is this, "We run our schools for the pupils by the teachers. As a well known firm advertises cream "from contented cows", I have taken a cue from them in order to get the cream of education out of a corps of contented teachers.

The merits of the plan have been voiced by many, the objections raised but few; and it is the purpose of the rest of this discussion not to point out the desirable features but to bring to you the stumbling blocks as we found them.

The Teachers' Difficulties

The first difficulty I encountered was this: The teachers failed to budget their assignments in about the same degree as the students failed to budget theirs. This I determined was due to improper teacher training. Bright students finished their monthly assignments with ease and had time on their hands. I tried to make them see that it was their duty in our "little democracy" to help their less fortunate brother who through some mental handicap was kept as part of the rear guard. Persuasion of this kind worked about as well as though I was trying to get some successful business man to stop his work and go across the street and help a less successful merchant who was about to go into bankruptcy.

The teachers were swamped with written work and red pencils grew to be in great demand. I believe that the staff tried to treat each student as an individual and worked as hard on the plan as though they had been receiving two dollars an hour for tutoring. The bright students liked the plan because they could slip out of work; the dull students grumbled because the teachers were always busy and it was hard for them to get help; the average student seemed to stay about where he formerly had been.

The halls became a source of great annoyance and, when the boys and girls were questioned about loitering, they always had the alibi that they were just going to Miss K's room. The hall problem became so great that it was necessary for us to police them constantly. However we devised a check on this and that helped in keeping tab on the students and added a little more work to the teaching schedule.

The scheme had been in operation about two months when some of the boys who stolidly maintained that they liked the old system better than the new, secretly started to circulate a petition. In this little document the student signers requested us to return at once to the good old-fashioned form of instruction. A friend of the Dalton plan, a student who saw his easy marks slipping, told me about the petition. I at once called an assembly and told the student body that a few of the boys wanted to test the feeling regarding the popularity of the new way we were running our school. I turned the meeting over to one of the leaders and a lively debate ensued. I think without question that this unorganized debate held on the floor of our auditorium was the best lesson we ever taught under the Dalton plan. The affirmative won and saved me the embarrassment of announcing that we would return to the old plan. Public sentiment seemed to end that argument, and never again was I asked how long we were going to continue the experiment.

Shops Needed No Daltonizing

The shop work of our school always has been an individual proposition. The teachers used job sheets or lesson sheets before they became generally used among other vocational schools. With superior teachers in our shops, the Dalton plan had very little to offer by way of improvement in organization, but from the teachers' point of view it seemed to stir the whole program up into more or less of a general muddle.

Miss Parkhurst in "The Dalton Laboratory Plan" says: "The Dalton Laboratory Plan must not be regarded as a cast-iron scheme. I offer it as a step towards the evolution of a scheme which will develop the creative faculty of both teachers and students". If by the creative faculty of teachers Miss Parkhurst means the creation of new and better teaching devices, then I say that this foundation must be laid in teacher training schools by showing these teachers in training what is being done and developed by teachers on the job. Certainly a trade school develops the creative faculty of the student.

"Experience of the Dalton Laboratory plan shows moreover that it is beneficial to the pupil morally as well as mentally." It has been stated that where it is put in practice, conflict ceases and disorder disappears and that the atmosphere becomes one of industry and interest. I would like to give the teachers under any plan the credit for the above desired aims. I cannot believe that the problems of discipline become a "small factor". From my experience I know we failed to measure up to the Dalton yard stick. Under the old plan our school was one of order. Order and discipline rest entirely with the teacher and as a rule order is as good as the teacher. By order I mean work free from "horse play" and not students squelched into obedience by an oppressive hand. Under the Dalton plan, with the students suddenly released from all requirements, tardiness began to mount up, skipping began to grow frequent, and students sneaked out of the building soon after their names appeared on the roll, being gone for the rest of that half day. It

became necessary for us to check our attendance four times a day. At times parents called for their children and we were unable to find them, a rather embarrassing situation to be placed in.

Confusion began to accompany group study. Cliques began to show up among the students. I simply applied this old saying of my father's as a reason why small groups of boys and girls always found together were falling behind in their work. My father would say, "When I want to get a day's work out of my son, I put him in the corn field with a hoe and alone. When I want to get a half a day's work done, I borrow a hoe and a boy from my neighbor and put the two boys with the two hoes in the corn field. When I don't want to get any work done, I put my boy with two borrowed boys in the corn field." The above applies nicely to the freedom given under the Dalton plan.

The problem of cheating began to be an over shadowing objection to the plan. Students copied assignments and, when the teachers on the monthly check-ups and tests refused to mark for the work handed in, a lot of grumbling was done by the cheaters, maintaining that they had finished their contracts and that a new assignment should be given them. The cheating problem was finally overcome, but it caused a lot of anxious moments on the part of the teachers and pupils. And inasmuch as we had wished all this misery upon ourselves we had no one to blame.

Administrative and Teachers' Objections

Teachers voice their objections to the plan in this manner:

Students don't work but copy from the few who do the work themselves.

Dalton plan makes for shifting from one class to another before any real work is done.

Students form habits running along lines of the least resistance.

Students have so many excuses that it is hard to pick those that are genuine.

Oral expression is neglected and group conferences do not atone for this.

Valuable general topics and discussions are neglected and the pencil becomes the means of expression.

The janitor liked the plan because he always had a good supply of cheap magazines, Western Stories, etc., that he collected in the hall and locker rooms. There was no question but that the plan "stimulated" reading. The trouble came out of the "kick" the students got out of what they read.

Summarized, some of the disadvantages from an administrative point of view and the vocational Smith-Hughes work are:

The Dalton plan interferes with the Smith-Hughes vocational work because it breaks up the three-hour shop program.

It increases the cost of instruction.

Bright students slip out of work so easily that they become a problem on the principal's hands.

Dull students get so far behind in their work they become discouraged.

The instructor, acting as checker, examiner, and inspector, does not have the time for individual help that he had before.

The responsibility of doing the work shifts from teacher to pupil with the result that both lose out in delivering and collecting the goods.

The Dalton Laboratory Plan is organized under the same plan as shop vocational work, with this difference, that a lot of foolishness has been added to make it hard to administer.

A statement has been made that the plan requires guidance and supervision. There is no question about this, but when a doctor writes us a prescription we like to know the dose.

The Dalton plan is heralded for its elasticity. I know that is true because it stretched our system so badly out of shape that it took me months to get it back again.

Vocational schools as a rule qualify for the Dalton plan as they do not demand outside study. A slogan like "School is a place to learn and home is a place to live" isn't so bad. I challenge the statement that we are grinding out a standardized product and believe most vocational men will stand with me.

As a little more proof that the Dalton plan was not meant for the vocational field, let me quote again from Miss Parkhurst's book, an idea copyrighted as late as 1922: "Until the educational world wakes to the fact that the curriculum is not the chief problem of society, we shall, I fear, continue to handicap our youth....." The only objection I have to that statement is the fact that the words "educational world" is so broad that it takes in the vocational field. As I see it we are awake and nicely dressed, and I do not believe that vocational education needs to be reorganized from that standpoint.

If the Dalton plan was received abroad with open arms, it was because the schools there had not advanced abreast of the times. There also is need of pioneering in United States, but it is not to be found in progressive communities where we have vocational schools.

If there are a lot of ailments to be found among our academic schools and our academic minds, why should the vocational teachers, who are carrying vocational education to the top of our educational system, worry about them? Trade schools, vocational schools, industrial schools, call them what you please, work on the basis that they are teaching the boys and girls shop work, and not the vocational work to the students. It is the student we develop and not the subject taught, and that idea should meet up with the Dalton plan of fitting the curriculum to the student.

The Matter of Added Cost

From an economic standpoint the Dalton plan requires a great outlay in additional equipment and reference books. The pupil teacher ratio should be smaller than in the regular school. Add the additional expense of securing new and good teachers to the re-arranging of school equipment, as the plan suggests, and a large expenditure of additional yearly funds is necessary to operate. Do the results justify at the present time higher costs? Isn't nearly every progressive superintendent looking for a means of increasing the efficiency of his schools and of decreasing his yearly budget?

If more money is to be spent for teachers, I would suggest hiring superior teachers who are capable of carrying a heavier teaching load and adding to the salaries of these teachers the money to be expended. It is only by recognizing these superior workers that we can ever expect to build up a group of professional people. Once we have done that, method will become one of our small problems; the pupil product of our schools will be built up around these master teachers. Concomitant learnings will carry them into society, ready to meet the demands of society, in a manner approved of by society. I would like to demand of every theorist holding a chair of education in our universities a working job sheet of everything that is to be applied to the public schools.

Among the trade and industrial schools of our country there is a very close relation between the shop courses and the academic work offered. The related academic subjects should be and in most cases are of such a nature

that they really are a part of the trade taught. With a well trained corps of teachers a wide range of successful methods are to be found. This is to be expected if we are to train our students for successful entrance into the various fields for which instruction is offered. I believe that in a general way the progress made by this type of school, when it is considered the type of student we reach, is about as modern and abreast of the times as any one devised and thought out scheme could possibly be. Our industrial schools are built up of accumulative results of successful experiences and, if our academic brother would only look us over carefully, he could find much to be absorbed. In the meantime, I have no objection to his experimenting as I have done. Certainly there is a decided relation in the work we teach to the life we live and that is one of the strong points of the Dalton plan.

Wild Flower Designs

Article IX: Adapting Photographs for Decoration

Nettie S. Smith, Smith Center, Kans.

Flower Photographs as Source Material. When natural specimens are not available, photographs of flowers can be used to good advantage. Many of those to be found in books, magazines, and seed catalogs are valuable to the designer if he has the ability to translate them into decorative form.

Selection is Necessary. Some of the photographs offer too much material, too many lights and shadow, or shapes that are uninteresting, while some flowers are complex and difficult to use in design. Simple flowers and simple, uncrowded photographs should be chosen. Then, the knowledge that the designer is not to serve the photograph, but that the photograph is to serve the designer, will help him to take suggestions from it rather than to try in any way to reproduce the effect of a photograph.

A Flower Map. One of the best methods is to begin by making a "map" or chart-like drawing of the part of the photograph that will probably be used in the design. This takes one immediately into the field of decoration and saves him from doing what the photographer has already done for him. The photograph is a likeness but it is not a decoration, hence the designer needs a transition step.

The flower "map," A, in Plate 18, was taken from the Martynia photograph, Plate 17. It shows each important part of the selected material outlined and thus made to appear flat. This mosaic-like arrangement produces a design which has many possibilities. As it stands now it is suggestive of enamels, cloisonné, and some of the modern batiks, in which the separate compartments of the design would be filled in with colors.

A Process of Two Parts. Decoration will now be considered as a process of two important parts: composition and application.

I. *The Plan or Composition of a Design.* Composition consists of space filling and space breaking. If, for instance, a panel is to be used, this space must be filled in a pleasing way with the design material well balanced. If instead of a panel the place for decoration is round, square, or of any other shape, the same atten-

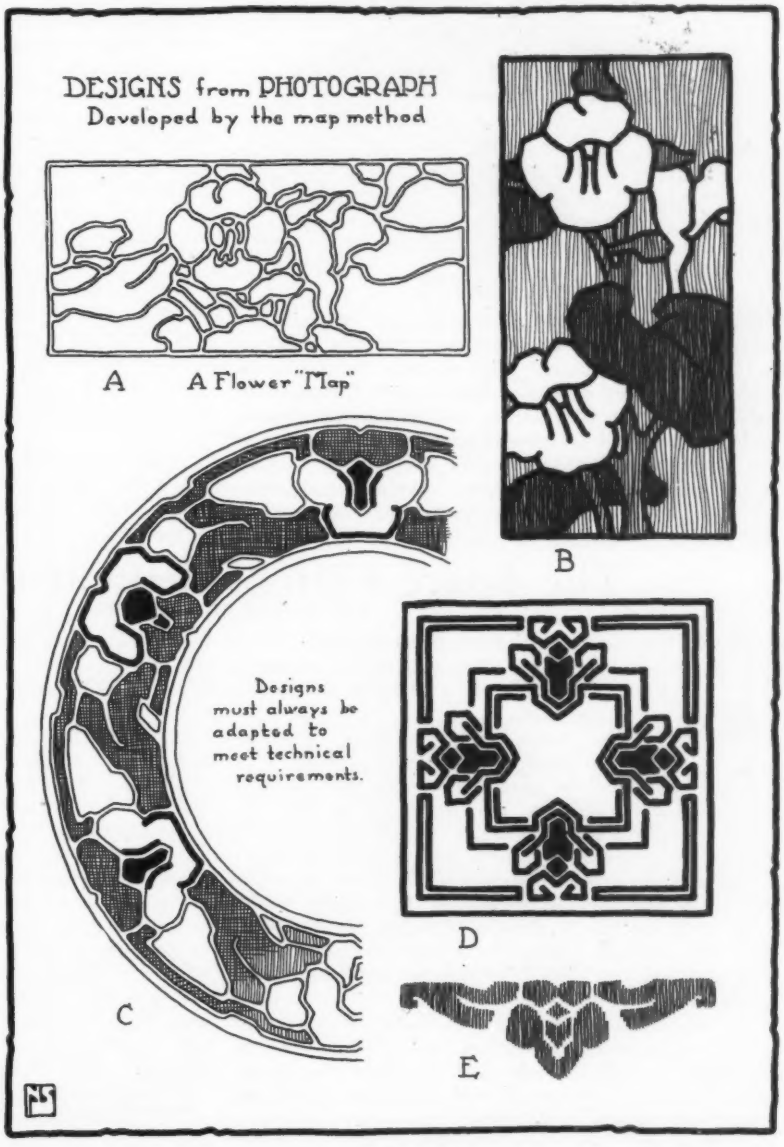


PLATE 18.

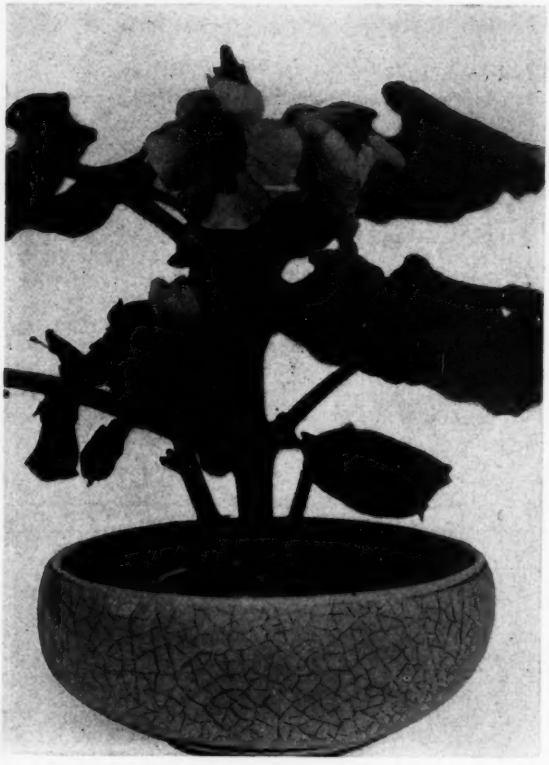


PLATE 17. MARTYNIA.

tion to space and mass relation is needed. A finder, or papers to cover part of the photograph, will help in selecting a good arrangement. The opening in the finder should be changed or moved about until the most desirable position has been found. As the drawing is made the forms employed are altered as much as necessary to give agreeable proportions in the composition. There must be variety, without extremes—large and small areas which will help to make some parts predominate while others are subordinated.

A group of small shapes draws attention and brings about a center of interest while the larger background spaces supply the rest areas. These quiet background spaces are really an important element in the design and should be made interesting in shape. When all these considerations are met every part of the entire enclosure is well used and harmony and unity prevail.

II. *The Application or Execution of a Design.* While this is not a textbook of the crafts it is our purpose to show the close relation between the two parts of the decorative process—composition and application—thus helping the design student to the master craftsman's ideal. Useful articles should be beautiful. This does not mean, of course, that everything must be ornamented but that it must be fit, appropriate, efficient, good for what it is intended. If an ornament interferes with this fitness it is out of place and would better be changed or removed entirely. There can be refinement of form and quality in workmanship whether or not there is any enrichment through ornamentation.

In decoration the purpose of the object, its shape, material, and the tools used in the making are all to be considered and the ornament planned to fit these in every way. One who is skilled in wood carving, knowing the technical requirements of his material and tools, will be able to plan designs suitable for carving: a potter will know how to make pottery designs; while one accustomed to needlework will be more apt in planning embroidery patterns. Each craftsman has some degree of ability in making suitable decorations for his own craft. He should also be able to take a flower "map" and adapt it to his need.

B, Plate 18, shows how the double outline can readily be changed to the poster outline, or a leaded glass effect. For the design C a paper was folded into six equal parts and the half design fitted into one section and cut, making a stencil. To what uses could such a design as this be adapted? Can you plan a design and execute it in true craftsman style?

The alert mind that is growing in creative ability will see great opportunity in this manner of transposing fragile nature forms into substantial beauty that will endure.

The Space Filling Element in Design

A. G. Pelikan, Milwaukee, Wis.

THE starting point for most elementary students of design, when the problem of space filling is considered, is probably the square or the rectangle.

One reason for this no doubt is the fact, that the majority of designs, whether they be facades for buildings, posters, floors, carpets, ceilings, furniture, books, paintings, etc., are based on the rectangle. Another reason is that the less complex geometric figure of the square lends itself to such a variety of interpretations, from the very simple to the more intricate, without any possibility of exhausting the supply.

It is in no way a check to freedom of individual expression. In fact, I believe that freedom is invariably more sane after some of the fundamental principles of design have been studied.

In the majority of cases we are dealing with average students. The unusually brilliant, or gifted student, is the exception rather than the rule, and when it comes to the genius, no teacher need fear that she may cramp the style of this unusual individual.

Occasionally there are a few students who feel themselves sufficiently gifted to disdain all tradition and therefore start out to create an art all of their own. From my own experience with students I can safely say, that as far as I know, not one of these students has ever turned out to be a genius.

For the less gifted student it is extremely difficult to find a starting point. With this in mind I have worked out the following problem in an endeavor to simplify the approach to the study of design to the student with little or no experience in the field of design.

The usual procedure in breaking up a square is to limit the student to the use of straight lines, first, because it assures a better unity or harmony of the design to the enclosing space, and second, because any attempt on the part of the beginner to use curved lines ends in a mass of meaningless scrolls. The problem described may be given following a problem in which the student has been limited to the use of straight lines, or may be assigned after a preliminary talk on unity and occult balance.

Problem:

1. Take a square of any given dimension and within this draw a free line which shall touch at least two sides of the square.

2. Trace this line on a piece of tracing paper and by moving the square, trace the line on all four sides of the square. You will now have a line arrangement within the square which will illustrate:

(a) occult balance, because the balance will be felt and will not be bi-symmetric,

(b) rhythm, because one line will lead into the other,

(c) proportion, because there will be variety in the size or measure of the units,

(d) radiation, because usually a central axis is formed from which the other lines grow or radiate (see figure C and F, plate 1),

(e) opposition, because there will be a change in the direction of the lines, i. e., vertical lines will oppose horizontal lines, etc.,

(f) repetition, by a similarity of line and measure.

(g) transition, because there will be angles which may be softened or strengthened.

3. Interpret the line arrangement into masses of light and dark or notan.

4. With a mirror pick out interesting units and draw these on another sheet of paper. The arrows on the squares A, B, C, D, E, F, plate 1, indicate the point on which the mirror has been held, while the corresponding letters on plate 2 show the result of this method of selecting. We now have good examples of bi-symmetric design which may be used for a variety of purposes. The second page also shows that a good line arrangement when interpreted in light and dark will make a good mass arrangement.

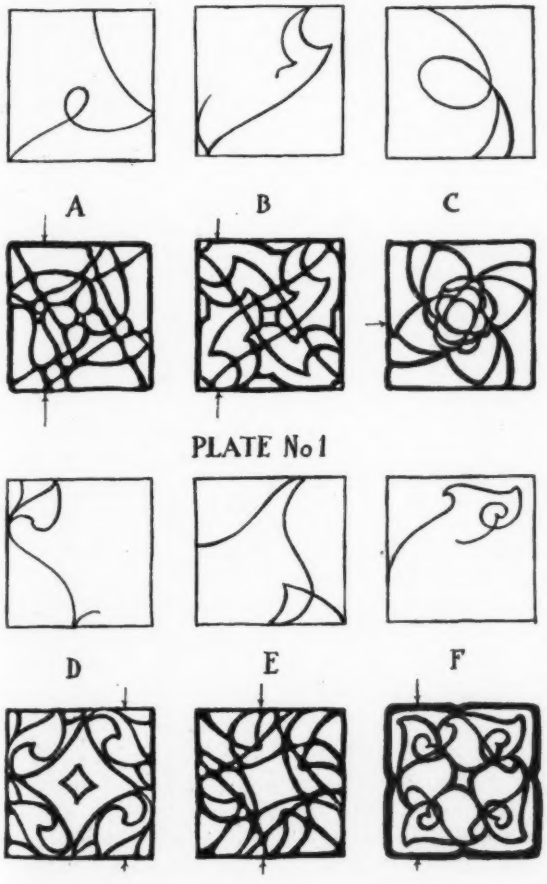


PLATE No 1

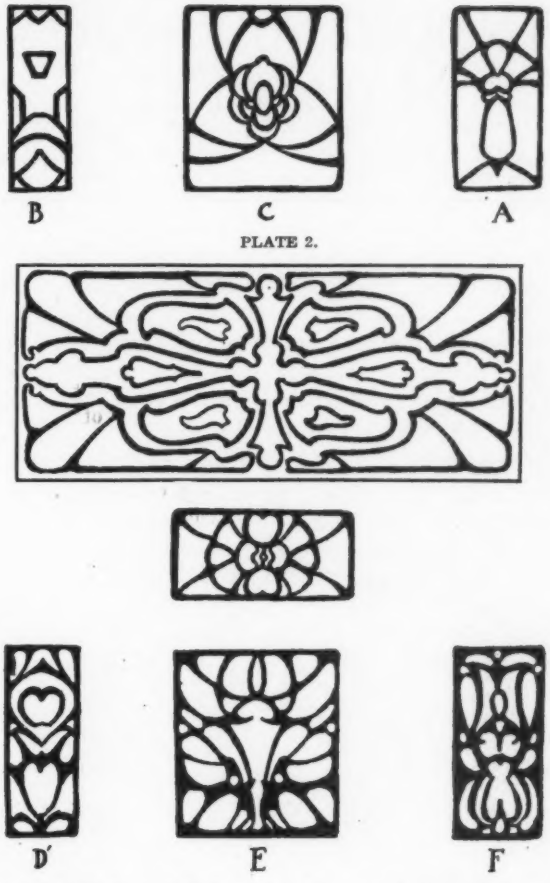


PLATE 2.

The squares may show a tendency to appear restless or move too violently. It is not intended that these squares should be left thus; they merely furnish a starting point for further development and lend themselves very readily for a variety of interesting and orderly designs.

It must be remembered that with the addition of color or the use of a less intense black than that used in printing a zinc cut, much of the harshness caused by the extreme contrast of black and white is overcome and added interest obtained.

The problem may be carried further by substituting free brush marks in place of the line, that is, by making a line with the brush which varies in thickness and which touches at least two sides of the square. This is then traced on the opposite sides of the square after it is dry.

Figures C, A, D, E, F, may be enlarged on tracing paper, the black lines serving the use of leaded lines in stained glass. The intervening spaces are colored with transparent washes of water color and mounted on a cardboard frame or lined with passe partout paper and hung on the window pane, or it may be pasted right on to the window to enliven a room which needs a little use of color.

A simple thing well done is always better than the pretentious attempts to over-elaborate without sound construction.

INDUSTRIAL-ARTS MAGAZINE

E. J. Lake S. J. Vaughn

Editors

DIVIDED WE FAIL

We have difficulty in sharing with C. Valentine Kirby the impression that teachers of art have gone farther and accomplished more for art education than teachers of other school subjects have accomplished for their chosen interests. This amounts to the conclusion that our public schools are artistically lop-sided. Perhaps Mr. Kirby had in mind a very few places in the country where teachers of exceptional ability have developed their work to high standards. We know of no case where art has been taught to the neglect of other interests, and we know of many places where art has had difficulty in holding importance with other subjects. On the whole we are of the impression that, while art has been rather well impressed through application to some practical interests by teachers of manual subjects, the art teacher has had difficulty in holding place as a distinctive subject the teaching of the fine arts.

We are convinced that the fine arts deserve a distinctive place in the schools for such application of art to other school subjects as may be given is not adequate. The boy needs more design than may be secured by the attempt to formulate a few projects in manual training. The girl needs more design than can be secured by the making of a few garments or domestic accessories. The teacher of home economics, or the teacher of manual training, is rarely a teacher of art beyond a few applications.

On the other hand the art teacher finds direct appeal to children and school official through design in these applied interests. Art is best impressed when applied to personal and local interests.

These conditions place the art teacher in a difficult situation with the subject in reference to the school and to other teachers. Either the art teacher must be strong enough in her subject to command the situation, or she must be satisfied to serve only the few who take delight in her particular instruction.

The history of art education in our schools is not significant of cooperation between those interested in subjects involving art.

No adequate content has been developed for art as a school subject.

Art has been one thing in one place, another thing in another place, and little more than busy work in some places. The programs of art teachers' meetings have been divided between various interests with too little emphasis on art teaching. Art instruction has taken the form of such a variety of mediums and methods that, if an exhibition of school work of the past twenty-five years could be brought together, it would represent every conceivable material and purpose but would suggest least of all a pedagogical plan for teaching art.

A definite statement of objectives for each grade and a definite plan of procedure to attain them will do much for the subject.

We may look with confidence to the Federated Art Council for a careful study of the situation and a gradual, logical improvement in art education but we cannot conceive success without highly competent teachers and a fine cooperation between all concerned.

RED BLOOD

And now one more college savant gets a place on the front page of the morning paper with these remarks from his holiday speech disparaging our public schools and teachers.

"Our children are nurtured in soft pedagogy by poorly trained governesses."

"No red-blooded man who could make a success of any other line of work will become a teacher in our public schools."

In both of these statements the professor was evidently mistaken or worse, for there has never been a time or place in history where more effective teaching has been done than in the lower grades of our public schools, and finer or more virile young men do not exist than may be found teaching in our public schools.

To be sure women teachers prevail in the grades but women are better teachers of children than are men. Compare the young American schoolma'am with the demure, underpaid schoolmaster of the continent and our alert school teacher is much better fitted to guide and develop small children.

It is in the important art interests that we are superficial.

We have as yet a sorry lack of both time and expert teaching to develop the American boy and girl in art and industry.

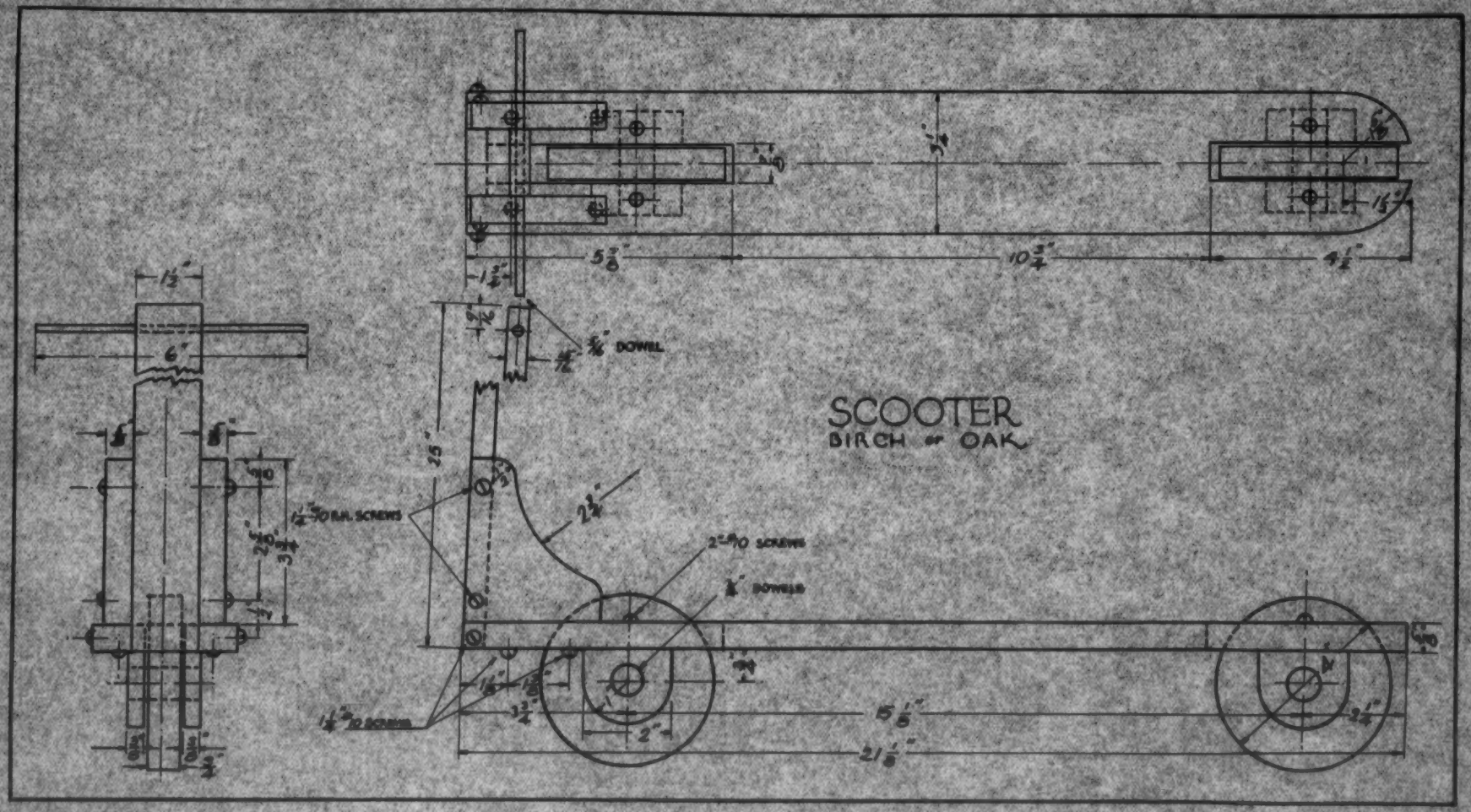
As for good, red blood on the teaching staff, our school teachers are becoming active leaders in social and civic affairs. The cooperation of the school teachers and children are essential to community interests and demonstrations. The fine spirit of cooperation between school and town is made possible by effective teaching and teachers.

The proverbial dictator of the schoolroom, with a rod in one hand and a text in the other, demanding a letter perfect recitation of exercises would be hard to find in our schools. No less rare, is the type of browbeaten, makeshift school teacher who lacks the initiative to do anything but hold a sedentary job.

Between exacting routine and soft pedagogy there is little choice but the implication that our schools are of either sort is denied by the thousands of active, virile teachers who are doing a better job in the development of our children than the parents of those same children who share responsibility with the teachers.

To be Reprinted for School Shop Use Only.

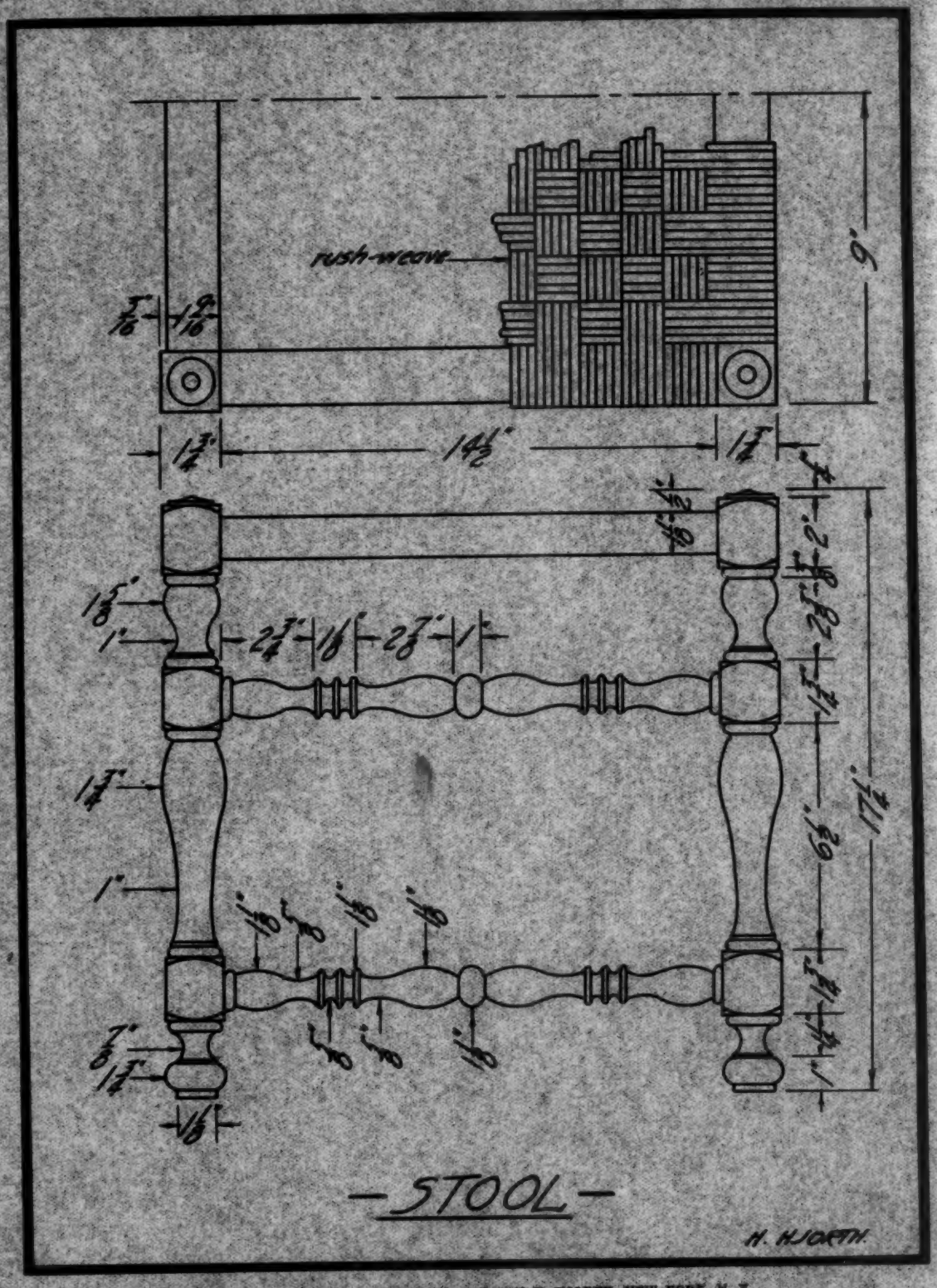
To be Blueprinted for School Shop Use Only.



Designed by A. J. Goldhorn, Hibbing, Minn.

For Details see Page 103, Industrial-Arts Magazine, March, 1926.

To be blueprinted for School Shop Use Only.

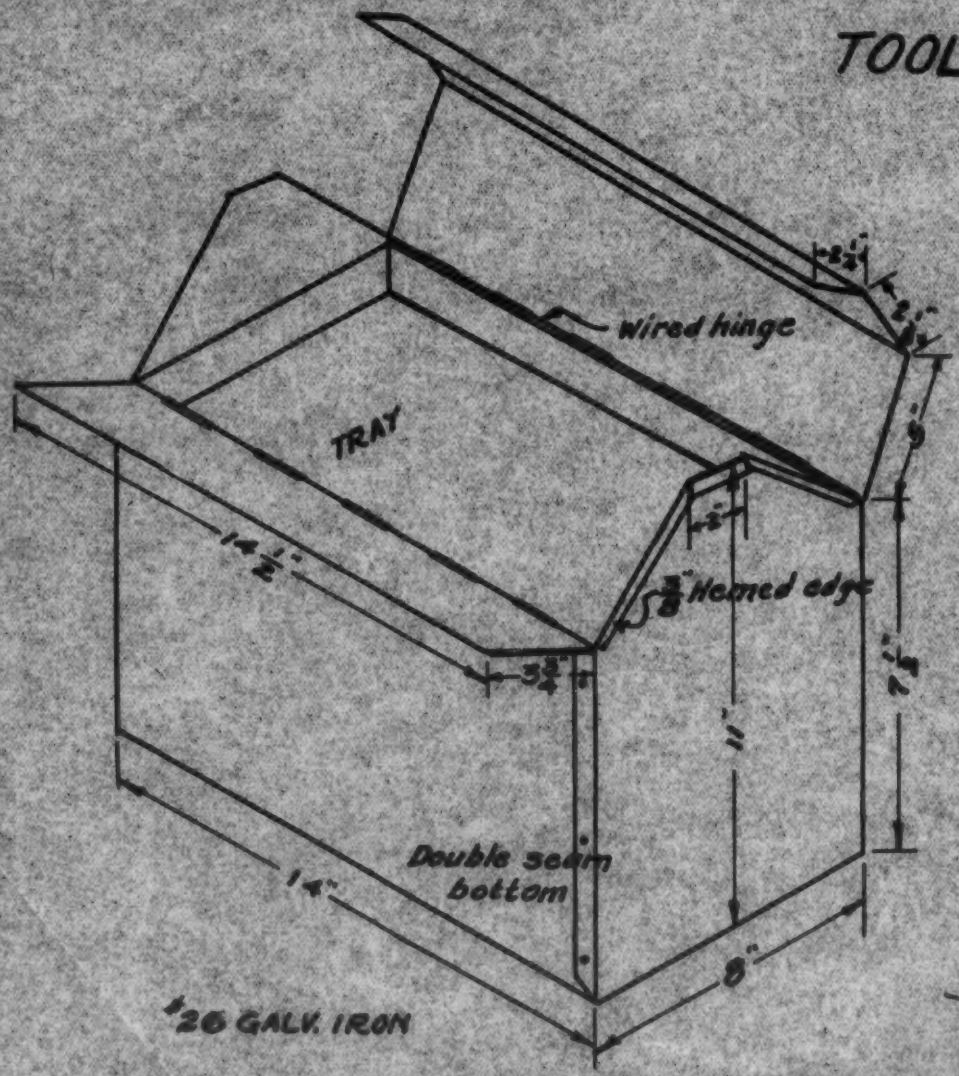


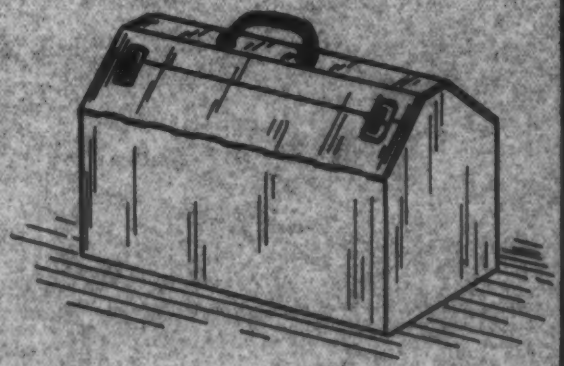
DETAILS OF STOOL DESIGNED BY HERMAN E. HJORTH, NEW YORK, N. Y.
(See Page 108.)

To be blueprinted for School Shop Use Only.
THE INDUSTRIAL-ARTS MAGAZINE,
MARCH, 1926.

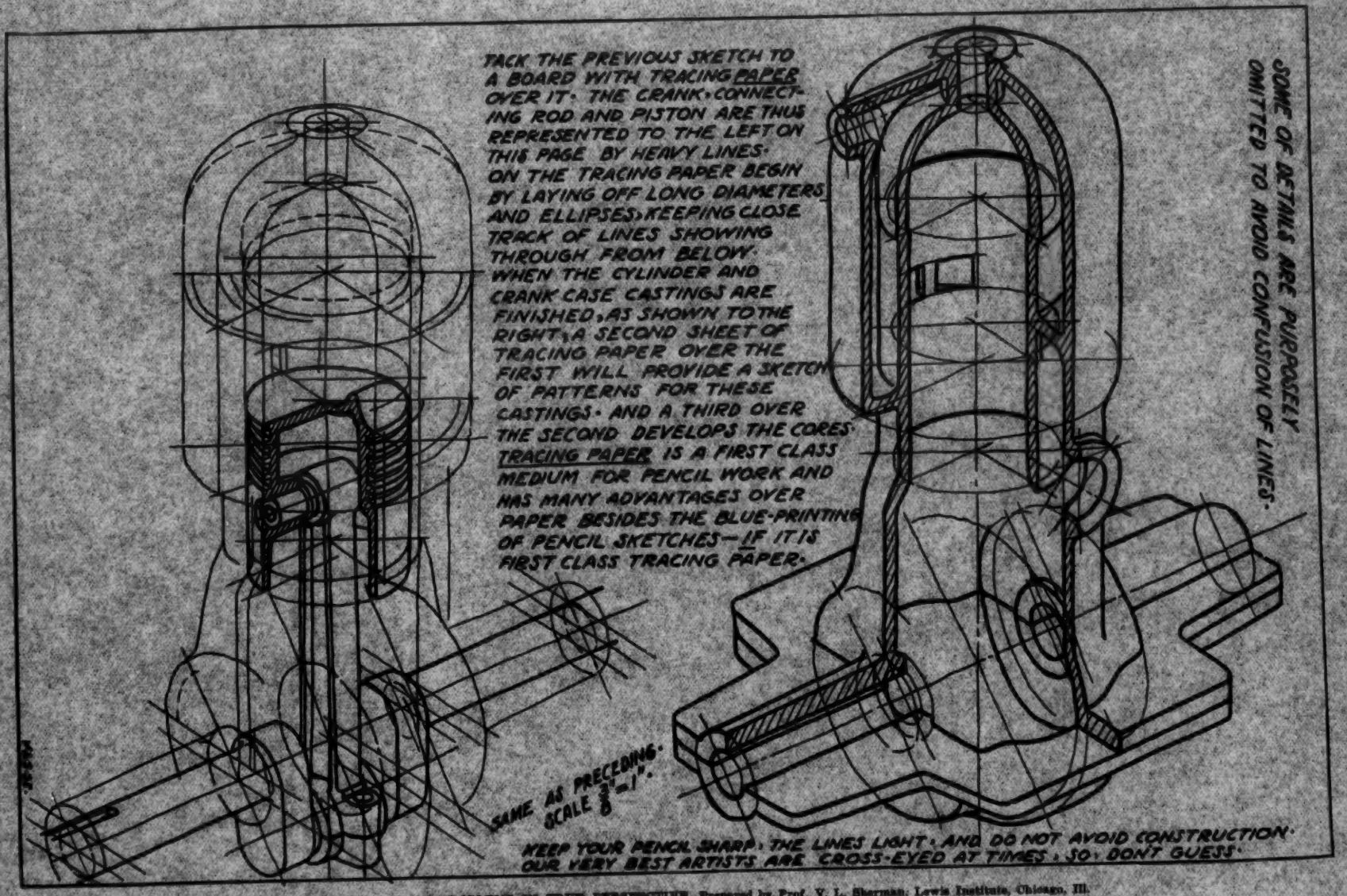
To be blueprinted for School Shop Use Only.

TOOL KIT





DESIGNED BY R. L. WELCH, STOUT INSTITUTE, MENOMONIE, WIS.


TACK THE PREVIOUS SKETCH TO A BOARD WITH TRACING PAPER OVER IT. THE CRANK, CONNECTING ROD AND PISTON ARE THUS REPRESENTED TO THE LEFT ON THIS PAGE BY HEAVY LINES. ON THE TRACING PAPER BEGIN BY LAYING OFF LONG DIAMETERS AND ELLIPSES, KEEPING CLOSE TRACK OF LINES SHOWING THROUGH FROM BELOW. WHEN THE CYLINDER AND CRANK CASE CASTINGS ARE FINISHED, AS SHOWN TO THE RIGHT, A SECOND SHEET OF TRACING PAPER OVER THE FIRST WILL PROVIDE A SKETCH OF PATTERNS FOR THESE CASTINGS. AND A THIRD OVER THE SECOND DEVELOPS THE CORES. TRACING PAPER IS A FIRST CLASS MEDIUM FOR PENCIL WORK AND HAS MANY ADVANTAGES OVER PAPER BESIDES THE BLUE-PRINTING OF PENCIL SKETCHES—IF IT IS FIRST CLASS TRACING PAPER.
SOME OF DETAILS ARE PURPOSELY OMITTED TO AVOID CONFUSION OF LINES.
SAME AS PRECEDING. SCALE 3" = 1".
KEEP YOUR PENCIL SHARP, THE LINES LIGHT, AND DO NOT AVOID CONSTRUCTION. OUR VERY BEST ARTISTS ARE CROSS-EYED AT TIMES, SO, DON'T GUESS.

A SUGGESTIVE PLATE OF PROBLEMS IN TRUE PERSPECTIVE. Prepared by Prof. V. L. Sherman, Lewis Institute, Chicago, Ill.
This is the last of a series of six helpful plates for teaching true perspective in a simple, direct manner.

TEACHING SUPPLEMENT No. 12
THE INDUSTRIAL-ARTS MAGAZINE
MARCH, 1930.

There is no more significant evidence of the development and effectiveness of our schools than the confidence of parents.

Schooling and more schooling for our children is demanded by parents as the only assurance of success and right living.

AUTOMOBILES, DRIVERS, AND EDUCATION

The development of the gasoline motor has made great changes in our modes of living, as well as in our modes of travel. This development is making great demands upon modern industry and no less demands upon modern education. One of the great economic problems right now is the problem of the motor car and its care and up-keep.

Garages have sprung up on every other corner. It is also becoming increasingly imperative that along with the garages and filling stations there shall be built adequate first-aid stations. Some are pessimistic enough to say that as an adjunct to these modern facilities, there shall be established prisons and reformatories convenient to the garages, filling stations, road houses, and other appurtenances of the present day vehicle of hilarity.

At any rate, it is quite apparent that at least an elementary knowledge of the principles of a gasoline engine and the handling of a motor car has become almost necessary. The appalling ignorance of those who drive cars of the principles and mechanism of their machines is alarmingly dangerous as well as foolishly extravagant. So-called automobile mechanics stationed at every crossroad are a tribute to the ignorance and the recklessness of the ordinary driver. The average driver has no conception whatever of what actually happens when he turns the switch and steps on the starter. So, when it stops, all he knows to do is to call a garage and be hauled in to the nearest town. It is altogether probable that nine-tenths of the car troubles experienced by the average driver are such as could easily be cared for without expense by a driver with even limited knowledge and training in the principles and use of such a machine.

Probably no better thing could be done for the boys and girls of today than to give them a simple demonstration of the operation and principles of the gasoline motor and the elements of the ignition systems in use in motor cars. A little training along these lines would carry over also into the operation, care, and repair of many of the mechanical appliances in the modern home.

It will be observed that in the above statement *"girls also"* are mentioned. Since they are among the numerous drivers of automobiles and frequently among that large, helpless group who must submit to the mercies and the ignorance, and the economic precocity of the cross-roads "mechanic," they are peculiarly in need of such instruction as will make their driving both safe and moderately free from the harassing annoyances of minor car troubles.

Since the car is here, and here to stay, let's learn to use it with safety, with satisfaction, and with reasonable freedom from the dangers of bankruptcy.

TEACHING A BOY HOW TO FIND A JOB

In the field of commerce and industry it has always been a problem how to bring the man and the job together. There are those who seek placement at the beginning of a life's career. And, there are also those who are already placed but are ambitious enough to seek a wider field of service and better remuneration. On the other hand, there are many unfilled jobs awaiting the right man.

It is a peculiar fact that employees who have the capacity to fill a job satisfactorily find themselves helpless when out of employment. They know how to work but do not know how to find work. All of which would lead to the belief that somewhere along their route of educational travel they had missed out on something. Evidently the capacity to fill a job and the ability to find a job are regarded as two different things.

The value of vocational guidance is no longer a subject for debate. It has become a fixed part of many public school systems, and has demonstrated its utility. But, there are many boys in this country who cannot come under the beneficent influences of an established vocational guidance bureau, and who must choose their calling without the aid of such an institution. The boy may have promptings in a certain direction, his parents may make suggestions, or friends may assist in providing a start. And yet when all is said and done, there may still be a wide difference between the unrealized ambitions of the boy and his immediate opportunities, or between the latent talents which are his and the chance afforded him to develop them. A boy may know what he would like to do, but may not know how to get the chance to do it.

The thought that a boy should be taught how to get a job has here and there in the recent past met with some encouragement. Edward M. Sullivan, a member of the Boston school committee, has recently concerned himself in the subject and in commenting on his efforts the Boston Traveler said: "One of the least understood plays in the game of life is getting a job. Grown men and women fumble and fail in their attempts to place themselves in the positions for which they are best adapted. No wonder, then, that boys and girls just out of school go at the quest of employment in bungling fashion!"

Some of the New York City schools, seeing a need for some guidance, have during the past year conducted classes on how to answer want advertisements and how to apply for a job.

The conclusion here must be that where regular vocational guidance is not at the service of the boy who must leave school and enter upon the battle of life by finding a job, that he be given some parting counsel as to the best method of finding what he needs and which may be suited to his inclination and adaptability. A whole life's career may depend upon the right start.

To be blueprinted for School Shop Use Only.

The Theory of Radio Reception

R. O. Buck, Lane Technical School, Chicago, Ill.

MANY teachers who are well versed in the theory of radio reception are at a loss for a simple explanation of the various phenomena that take place in the receiving of broadcasting. It is the purpose of this article to explain as briefly as possible the various steps in reception, in a manner in which it will "get across" with high school students.

Practically all energy reaches us in the form of waves. These may be light, air, or electrical waves, but in every case they are generated by a body which moves alternately back and forth. This movement which creates waves is called oscillation. Electrical energy which oscil-

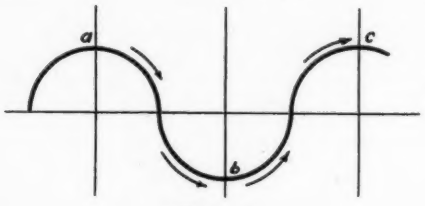


FIG. 1

lates in this manner is called alternating current. It undergoes a complete change or reversal from the highest side of a wave to an equal distance in the opposite direction, then back again to the highest point, as shown by Fig. 1. The number of such cycles, or changes from a to c, per second is called the frequency.

Ordinary alternating current for household purposes is usually of a sixty cycle frequency. For telephone work frequencies up to 5,000 are used and for radio communication the range is from 25,000 to 2,000,000 cycles per second. Frequencies that are within the range of the human ear are said to be of audio frequency while those of higher frequency are said to be of radio frequency. One of the functions of a radio receiver is to reduce the frequency of the incoming waves to audio frequency.

Radio waves travel out in all directions with a relative velocity of 186,000 miles per second and in much the same manner as the waves in a shallow pool do when a stone is thrown into the water.

The procedure in broadcasting is as follows: A wave of radio frequency is generated in the power plant of the transmitting station and is sent out over the antenna in the form of alternating current. This wave is of uniform frequency and of the frequency that produces the wave length on which that station is broadcasting. This wave may be called the "carrier wave" as it is the wave on which another wave which we will call the "message wave" is superimposed. The "message" wave is of varying strength as it is controlled by the motions of the diaphram in the microphone which vibrates as the sound waves produced by the voice strike its surface. The principle of the microphone is identical with that of the telephone transmitter.[1]

When the waves that have been sent out by the broadcasting station go out in all directions, they will strike against many objects such as trees, buildings, electric wires and aerials. All of these objects absorb some of the energy from the wave but only the aerial, in most cases, is tuned by a combination of varying capacities and inductances to the same frequency as the incoming wave and in it an alternating current of the same type and frequency as that of the transmitting station, will be set up. This current will necessarily be much weaker than the original.

Capacity and inductance are the twin mediums by which an aerial is tuned to the wave length of the broadcasting station so it is necessary that we know how each of them act. If two conductors such as two aluminum plates, while separated or insulated one from the other, are charged, they will store up a certain amount of electricity. This property is called capacity and the device is called a condenser. Inductance may be explained by making the comparison with the tuning fork which will set another fork of the same vibration period into motion, though they are insulated from each other. If current is passed through a coil of wire, it will induce a current in another wire that is near it but completely insulated from it. Producing a current from one conductor into another in this manner is called induction and the device is called an inductance.

The aerial is to all intents and purposes a huge condenser, one plate of which is the wire and the other the ground. The lead-in and ground wires through the primary coil form the only connection between the two. Fig. 2. The aerial which is charged by the incoming wave discharges through the ground wire, but in passing through the primary coil it serves a purpose. As the of the inductance of the same frequency. As this frequency is much too great to operate telephone receivers,

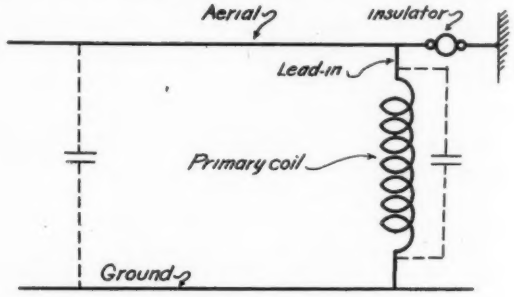


FIG. 2

current oscillates through the primary coil of the inductance, it induces an oscillating current in the secondary some device must be used as a detector to reduce this frequency.[2] It has been found that certain mineral crystals have the peculiar property of allowing alternating current to pass through them easily in one direction but practically preventing the flow in the opposite direction, thus having the effect of passing only one side of the wave and thus converting alternating current into a direct pulsating current of audio frequency.

By using such a crystal in a circuit, as shown by Fig. 3, it will be readily seen that the phones will now respond to the pulsating current of audio frequency that is flowing through them and will reproduce the same sound waves as were sent out by the station. It is the "message current" of course that causes the variation in the strength of the magnetic field of the telephone receiver which in turn vibrates the diaphram. The vibra-

[1] A more complete explanation of the theory of the broadcast wave would be beyond the scope of this article.

[2] If the matter were taken from a more technical angle the statement might be made that the detector action is rather more a smoothing out rather than a reducing of the frequency. It is not considered advisable to go into this phase of the matter in an article of this type.

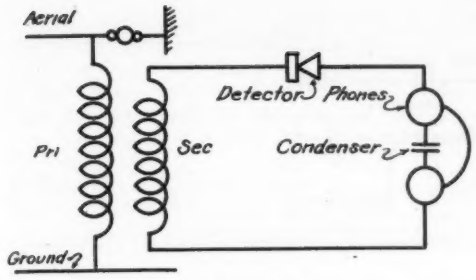


FIG. 3

tions of the diaphram cause sound waves to strike your ears and produce the same sounds as originally caused the microphone diaphram to vibrate.

The following units are essential to a receiving set: An aerial, which brings the radio current to the set; some form of inductance or capacity to tune the circuit to the required wave length; a detector to convert the high frequency alternating current to pulsating direct current of audio frequency, which may be accomplished by the use of either a crystal or a three element vacuum tube; and telephone receivers to convert pulsating direct current into sound waves. A loud speaker unit of course performs the same function. Each of these important units will be taken up in turn.

There are many types of aerials in use, but the principle of all of them is identical whether they be of the loop, outside, or inside type. The greater the surface presented, and the further it is from sources of leakage, the more efficient the aerial will be. In general a single wire stretched as high as possible and about 125 feet in length, including the lead-in, which of course must be considered a part of the aerial, is most satisfactory.

Inductances or tuners are of many kinds, from a simple single winding coil to the very complex vario coupler and variometer units, honeycomb coils, spider webs, doughnut, etc. Each of these has its special advantage in the particular circuits for which it is designed, but all perform the same function, namely, to put the circuit into resonance with the wave oscillations sent out by the broadcasting station. The vario coupler is the most efficient instrument for varying the inductance, as it gives a full range from zero to full value by changing the inductive relation or position of the coils.

Condensers play a big part in this same operation, for by varying the capacity of the primary or secondary circuits as well as the inductance, the range of the receiving set can be greatly increased. A condenser in series with the aerial circuit will reduce the wave length received, and a parallel arrangement of a condenser adds to the capacity of the aerial circuit and therefore increases the wave length.

Silicon and galena are the most commonly used materials for crystal detectors, but the use of this type of detector is no longer popular because of the difficulty of retaining the socalled "sensitive spot" and the greater efficiency of the vacuum tube as a detector. The use of a crystal detector greatly limits the range of a receiving set, and the present development of radio would have been extremely unlikely but for Dr. Lee DeForest's invention of the three electrode vacuum tube.

Tubes are used for two general purposes in a receiving set, as detectors or valves allowing only one way passage of the high frequency alternating current sent out by the transmitting station, and as amplifiers after the current is changed to a pulsating direct current by the detector.

Tubes are glass bulbs with a metal and porcelain base quite similar in appearance to electric light bulbs. Inside the bulb there are three electrodes or current carrying devices: a filament which is placed in the center and arranged with leads so that it can be heated from an outside source of current; a plate which is an outer wall arrangement completely surrounding the filament; and the grid, a spiral or mesh-like formation which is placed between the plate and the filament, as shown by Fig. 4. The tube is partially evacuated usually by a chemical process. A tube is said to be "hard" or "soft" according to the degree of evacuation it has received.

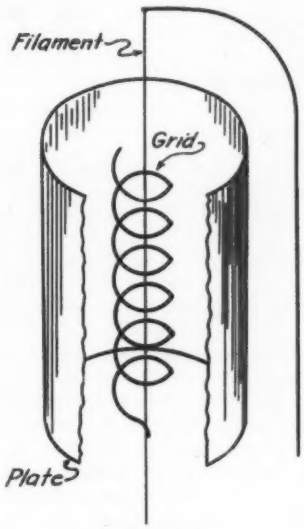


FIG. 4

When the filament in a tube is heated to incandescence, small particles, called electrons, or negative charges of electricity, are thrown off. If the plate of the tube which completely surrounds the filament, is positively charged by a "B" battery voltage, there will be a flow of electrons from the filament to the plate of the tube which flow of electricity will add itself to the "B" battery current. The flow of electrons, or negative electricity, from the filament to the plate is caused, because unlike charges of electricity attract each other. If the plate were made negative by reversing the "B" battery, the plate would repel the electrons as like charges repel each other. If an alternating current is impressed on the tube, it will allow a flow of current from the filament to the plate but not from the plate to the filament. In this manner alternating current is changed to direct current, just as in the case of the crystal detector. It is the third electrode or grid that gives the tube detector a great advantage over a crystal, as the tube not only rectifies but amplifies the current as well, the additional strength being supplied by the batteries in its circuit.

The grid is usually a wire mesh placed between the filament and the plate in such a way that current passing from the filament to the plate will have to go through it. The slightest change in the grid current powerfully affects the current flowing from the filament to the plate, because it either adds or detracts from the attraction the plate has for the electrons. In this way the grid acts as the governor and controls the flow of current through the tube. The grid potential is furnished by a battery, but requires very little power to operate the grid as compared to the power it controls, so it is said to amplify. Figure 5 illustrates the action of a detector tube.

Ordinary telephone receivers and radio phones and speaker units are essentially the same in principle. They consist of a thin, soft, iron disk placed across the poles of a combination permanent and electro-magnet. When a variation in the current flowing through the windings of the electro-magnet occurs it varies the amount of pull on the iron disk or diaphram. This diaphram, being flexible, will respond to these changes and in turn set up

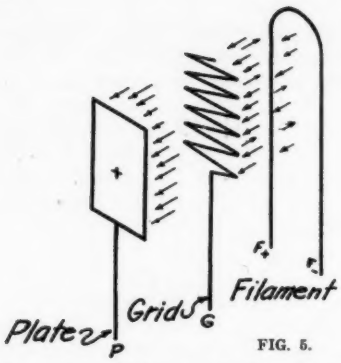


FIG. 5.

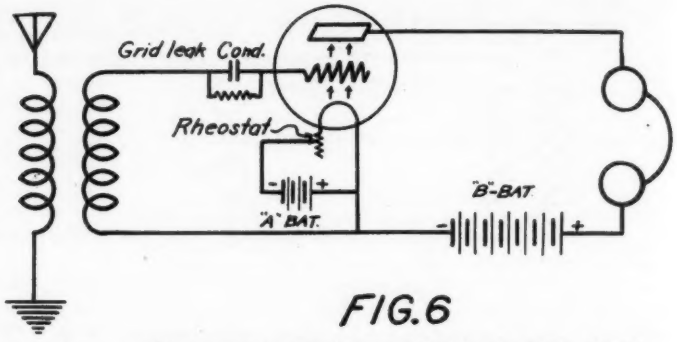


FIG. 6

air waves which are similar to the waves causing the fluctuation in current and identical with the original waves which struck the diaphram of the microphone in the transmitting station. It is these sound waves produced by the receiver that affect our ear and cause us to hear what is being broadcast. The function of the phone, then, is to change the audio frequency waves to sound waves.

Assuming a simple circuit, such as shown in Fig. 6, the operation of a receiver might be summed up as follows: The current flowing from the aerial to the ground through the primary circuit of the inductance, induces a current in the secondary circuit which consists of the secondary windings, tube, filament or "A" battery, plate or "B" battery, and phones. When the filament of the tube is heated by the "A" battery, a flow of electrons goes from the filament to the plate and grid, which completes the circuit to the grid and also the plate circuit through the phones.

The oscillations in the current in the grid circuit will vary from one instant to the next and thus will vary the flow of current to the plate because any variation in the grid current is greatly magnified in the plate circuit.

The grid leak is a high resistance leak provided so that, if the grid becomes charged with too great a negative charge, it will leak off and thus restore the balance and allow a normal flow of current from the filament to the plate.

As the phones are connected directly in the plate circuit, any variation in the flow of current in this circuit will vary the magnetic pull of the magnets, causing the diaphram to vibrate and produce sound.

The current which comes to a receiver is very weak and, if any great amount of volume is desired from the phones or loud speaker, it will be necessary to amplify the current. This may be accomplished in one or both of two ways. The radio current may be amplified by the use of tubes and transformers before it has been rectified by the detector tube or it may be amplified by the use of tubes and transformers after it has been rectified. The former is called radio frequency amplification and the latter audio frequency amplification. Each of these methods present difficulties and limitations which are considered beyond the scope of this article.

A Prescription for Production

Harley H. Goodwin, High School, Manhattan, Kans.

"Here are several jobs we need right away," has been a common greeting for many high school printing teachers at the beginning of school. "Oh yes, there are several more that we will want a little later this month, so you need not worry about not having enough to do," is the usual conclusion to the conversation. It certainly has been "life's darkest moment" for the writer more than once during the organization period at the opening of a school term.

Production in the school print shop is recognized as a necessary evil and impossible to eradicate entirely from the work. It is like some poisons, taken in small doses, it does no harm; but in large quantities, it usually kills the taker. The prescribing of the proper dose has been a long debated question among teachers of printing throughout the length and breadth of the land.

Fully realizing that certain types of productive work are real aids in classroom instruction, if available at a time when they can be used to advantage, I felt that I had a beginning to properly prescribe for my particular case. Plans have been presented from to time that have been satisfactory, and will apply in many shops. Suggestions for solving this problem should not be "hid under the bushel," but passed on.

Without a doubt the idea is not a one hundred per cent solution of the problem. The plans presented here are not fancies or dreams of a visionary, but have been tried for the last eighteen months with considerable success. Some of them might prove an antidote for other teachers, long suffering from this apparently incurable ailment of "production."

My investigations have proved that ninety per cent of the printing required by our school system can be produced any time during the school year. Since that was the case I could see no reason why these jobs should not be used as concrete examples of the work which the students were doing as an essential part of the course.

Two difficulties presented themselves in using these school jobs: that of devising some plan whereby the reordering would not be postponed until the last sheet was used; and the other, school printing did not represent a well rounded list of typical jobs such as come to the average commercial shop. The work required by a school system usually consists of large numbers of ruled forms, blanks, and other work of a tabular nature. The large variety of jobs found in the average commercial shop is entirely lacking in the school shop, for a school system does not require such a wide range of work. The second objection I let take care of itself for the time being the best it could, and set to work on the other one.

I listed and filed all the forms used in the system as to kind and the time of year required, and then classified them as to the style of composition they illustrated.

The school year is divided into six periods of six weeks each, so I divided the work into six groups, placing in each group forms that the beginning student as well as the advanced could use to illustrate the work being done at that time. Consideration was also given to the time when these forms might be required by the school

board office. Considerable allowance of time was made for all jobs so that no rush work would be required in producing these forms. So far we have been able to keep well ahead of the requirements. This has allowed one student to complete each job which he has started. Some work has been finished at least six months in advance of the time required.

Interference with the routine of class instruction was avoided to a very large extent in anticipating the needs of the school system by planning the year's work in this manner.

The superintendent of schools was quite in favor of the plan when presented to him for approval. He further suggested that any new forms which the school system might require should be made out and included in the next succeeding six weeks' quota. He also stipulated that any other work needed should be ready a sufficient time in advance so that it would fit in with this new plan, and a requisition must be made out on the printing department for this work as well.

The department was given the privilege of deciding whether or not the work not included in the regular six weeks' quota could be done at the time required as a part of the instructional work, and if not, it should be taken to a commercial shop. The last suggestion or rule has been a very great aid in caring for the problem of rush jobs that are usually a part of the productive phase of a school printing department. It has become very easy to say "no" to any of these requests, and there is no complaint either.

At the beginning of each six weeks, a list of forms and copy is received, which is checked over with the supply on hand in order that no omissions have been made. This list also includes any other forms, not on the year's schedule, which have been added. Oftentimes the supply printed will last more than the year, which reduces the amount of work to be done during the period. Quite often it is possible to complete more than the work scheduled for the six weeks' period, provided the work for the next period will fit in with that done at the present time.

Zinc etchings have been made of the forms which are quite complicated, and this reduces the work of composition to a considerable extent. Other forms that are not permanent in style and of a complicated nature are sent to a commercial shop to be machine-set. The use of plates and linotype material adds considerable variety to the work, and also gives the students an opportunity to make up jobs that include these materials.

The work required by the school activities offers numerous opportunities for good examples of other types of commercial printing, such as posters, tickets, programs, and advertising circulars. An attempt has been made to work out ideas in various forms of advertising novelties in order that a wider range of concrete jobs common to commercial shops may be used.

Handling all work of the school activities presents quite a problem nevertheless, for the time element is a big factor. The main requirement placed upon this work is that all copy be ready a sufficient time in advance of the date required. When this is done, the work can be handled in the same manner as the regular work of the school. The jobs presented a short time before the date required are turned down, and must be sent elsewhere. Some of the school and student organizations have considered this a great hardship at first, but they now realize that the school shop has something else to do besides rushing around getting out work for them.

The bulk of the activity work, including the school paper, is handled by the advanced students. This class is conducted in a similar manner to a commercial shop in so far as school conditions can be adapted to those in a shop. All jobs are placed in job envelopes; time slips are kept for the different operations that enter into producing the jobs. A charge that might be made in a commercial shop is figured out by the student doing the work.

At the beginning of each month a report is made to the superintendent, showing the work done and the approximate value of the jobs produced. For all activity work, bills are made out covering the cost of materials and a depreciation charge, usually equal to the cost of materials. This is presented to the treasurer of the organization, who then pays the bill to the treasurer of the school board. The fund thus created is used to replace or purchase new equipment for the school shop.

A record is kept of the jobs done by the students so that duplication of certain types of work is avoided. The students are required to keep a file containing copies and proofs of all work produced by them during the year. This also includes the advertisements set for the school paper.

The school paper furnishes a difficult problem as there is a repetition each week in the composition of advertising and the make-up of pages. At present all straight matter is machine-set, but the heads and the advertisements are set in the shop. Two students do all the make-up from a dummy furnished by the editor of the paper. The students change each week on the work, thus giving an opportunity for the whole class to get several chances at this type of work during the year.

The reorganization of the productive phase of the shop time has left more time to be spent upon the theoretical work and other phases of the industry than ever before. Previously, practically no time could be spent upon the theoretical side of the work. It has been a case of putting the ailment "production" to work, serving us rather than we being a slave to the ailment.

Students have manifested a greater interest in the work since this change has been made. They are requesting the privilege of returning after school hours, to work in the shop on some job started during the class period, in order that they might get the work completed by a certain time, or because they were a little behind some other student. It is now a case of "how much can be done," instead of "how little can be done." The spirit of friendly rivalry that has been developed is certainly working wonders among the students.

I feel that I have diagnosed and prescribed for my case quite well, for a slow but sure recovery is being made from the apparent chronic ailment, "production."

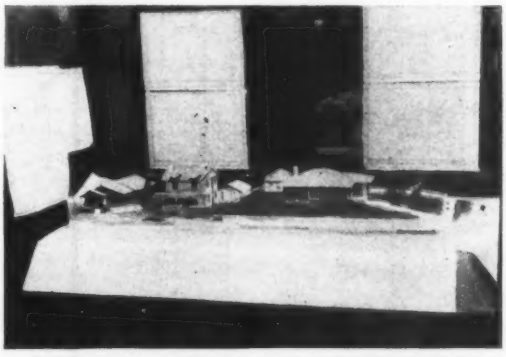


EXHIBIT OF THE INDUSTRIAL ARTS DEPARTMENT, CLINTON, IOWA.

At the close of the school year 1924-25, the Industrial Arts Department of the Clinton High School made an exhibit in a down-town hardware store. The work shown consisted of small model houses planned by the advanced classes, and a variety of drawings of projects designed and made in the class. Mr. W. B. McMahon is the instructor in charge of the department.

Two Turned Stools

Herman Hjorth, New York City, N. Y.

THE following two problems are, like the lamps, of simple construction and therefore suitable for classes in woodwork of intermediate or junior high school grade. They both involve some wood-turning, some simple construction, some weaving (in the latter), and some wood finishing.

The Stool, Fig. 1, is typical of early English furniture of the Jacobean period (1603-1649) when chairs and sofas were only used by persons of wealth and position. Common people sat on stools and forms (benches) with a hard wooden seat, but without a back. In our day such a stool would not find much favor as a seat, but it may be used at the side of a sofa or comfortable arm chair as a very convenient little table, on which may be placed cigars or cigarets, an ash tray, books, magazines, refreshments, or any of the numerous little things that contribute so much to present-day comfort.

The legs are first cut to length and roughly squared to about 2″. They are then centered in the lathe as accurately as possible and turned (or scraped). The square parts are carefully planed to dimensions after turning. It will usually be found that the round and square parts do not center exactly, and that more has to be planed off on one side than on the other. For this reason it is recommended to cut the stock to a larger diameter than actually needed. The rails and stretchers are now cut to size, and the mortises and tenons laid out and fitted. The pieces may also be joined with dowels if desired. A bead is cut along the edges of the rails. It may be cut very easily with a marking gauge. The spur should be sharpened as a wedge and two lines cut quite deeply. The edges of the piece of wood between the two lines are then rounded with a chisel and sanded. (See Fig. 2.)

It is recommended to glue two opposite sides of the stool first, and let them dry, instead of trying to glue the whole framework at once. The edge of the top is shaped as shown. If machinery is not available, it may be done by first gauging the width of the rounded edge with a sharp marking gauge, and then shape the edge with chisel, plane, and sandpaper. The top is screwed to the rails after they have been planed level with the top of the four legs. Three methods of doing this are clearly shown in Fig. 2.

The stool, Fig. 3, is modern in design and quite comfortable to sit on. A tenon is turned on each end of the stretchers and corresponding holes bored in the square parts of the legs. The rails over which the seat is woven may be joined to the legs in the same manner. The edges

FIG. 1.

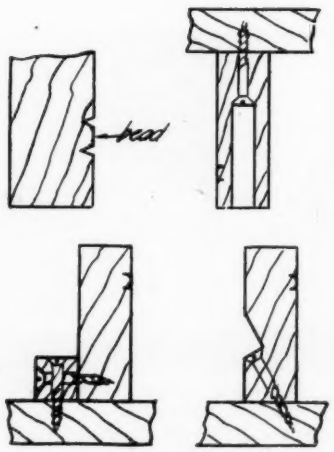


FIG. 2.

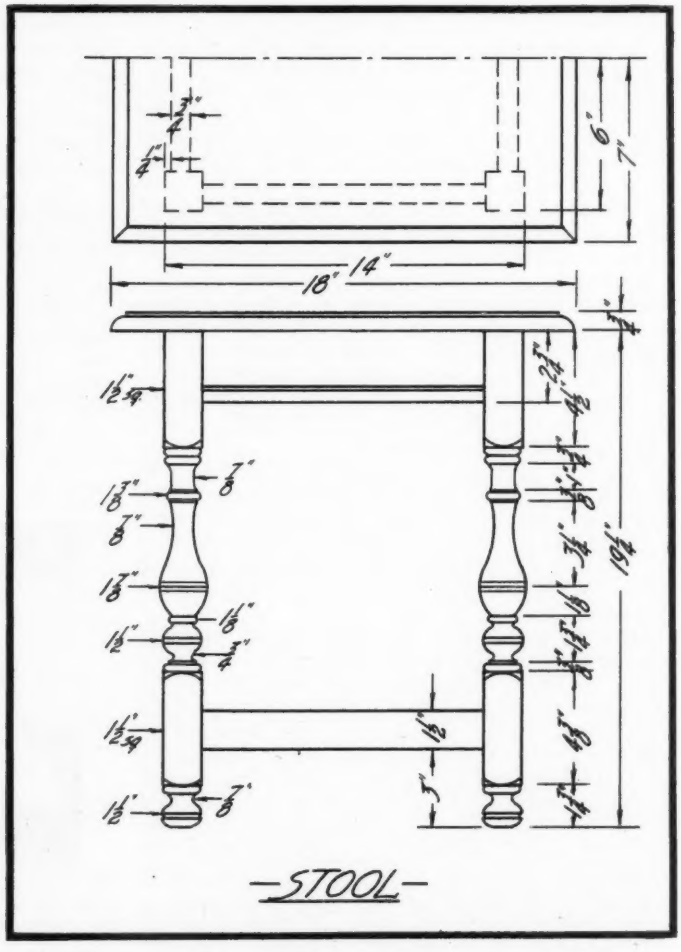


FIG. 1A. DETAILS OF STOOL.

FIG. 3.
(For detailed drawing see Supplement No. 10.)

of these rails should be rounded so as not to break the weaving material.

Art fiber, which is really paper twisted to a ropelike shape, was used for the weaving of this seat. The method of procedure is as follows: (See Fig. 4.) The fiber rope is tacked to the underside of rail 1, brought over 1, under

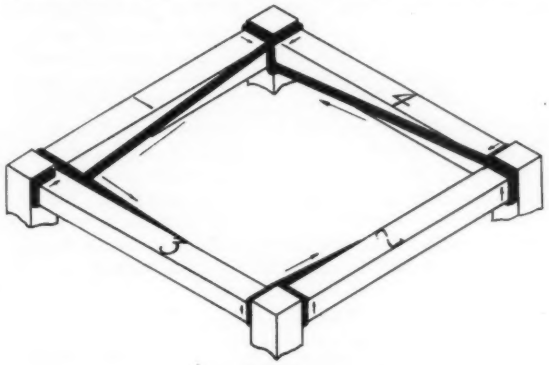


FIG. 4.

2, back over 2, under 3, then over 3, under 4, over 4, under 2, over 2, under 1, over 1, under 4, over 4, under 3, over 3, under 1, over 1, and so on until the seat is completed. As the weaving progresses paper should be stuffed in between the upper and lower strands to make the seat more solid. The four turned rosettes are glued to the top of the legs.

The two stools were made of solid mahogany, darkened with bichromate of potassium dissolved in water. They were filled with paste wood filler and given several coats of boiled linseed oil thinned with turpentine. Each coat was rubbed until perfectly dry and allowed to stand for 24 hours.

A CHECKING SCHEDULE FOR MECHANICAL DRAWING

Floyd D. Slater, Rochester, N. Y.

The accompanying illustration shows a very practical and convenient checking and grading scheme for use in rating students' mechanical drawings. The chart takes into consideration the major items such as accuracy, appearance and time, and offers a number of demerit symbols which the instructor may employ in checking drawings. The grade of the student's work depends upon the number of demerits.

In grading the student's drawings, it is suggested that exceptional initiative or efficiency should cancel a minor demerit caused by speed, when the discrepancy has no bearing on the accuracy or service of the drawing. On

CHECKING & GRADING
MECHANICAL DRAWINGS
The student should consider these major and minor items as he makes & checks his drawings.
ACCURACY
by
MEASUREMENTS, DIMENSIONS, CONVENTIONS, COMPLETION.
A mechanical drawing is not reliable unless it is ACCURATE.
APPEARANCE
by
LOCATION of VIEWS & DIMENSIONS, NEATNESS, LETTERING.
A working drawing is not efficient if it is not easily interpreted.
TIME
by
EFFICIENT PROCEDURE, INITIATIVE, INDUSTRY.
The student must take a real interest in his work and learn to use his time to the best advantage if he is to compete in the industrial world.
The instructor will use these "demerit" symbols when checking drawings.
M Measurement, wrong.
A Accuracy 'lacking.
L Lettering 'poor.
N Neatness 'lacking.
P Procedure 'lacks System.
V Views poorly Located
D Dimensions wrong
DP Dimensions poorly Located
DO Dimension Omitted
VO View Omitted
C Convention or Symbol, wrong
CO Convention or Symbol, omitted
AR ARROWHEADS poor
LO Lettering, omitted
B Business. Secondary
I INITIATIVE 'lacking
The grade of the student's work will depend on the number of demerits.
100% 95% 85% 75% 65%
Success Above Average Average Below Average Failure
A B C D E
1 or 2 DEMERITS
3 or 4 DEMERITS
5 or 6 DEMERITS

the other hand, apparently small discrepancies may change a grade from superior to average.

The present system of marking has been successfully used for some time and it has effected a marked improvement in the character of the drawings made by the students.

THE FEDERAL SUBSIDY TO VOCATIONAL EDUCATION

The Federal financial aid to vocational education provided in the Smith-Hughes Vocational Education Act has reached the maximum provided by the Act the present fiscal year. From now on, unless amended by Congress, the Federal appropriation remains constant: $7,000,000 a year, alloted to the states on the basis of population and $154,900 as special allotments to guarantee minimums to each state.

The Smith-Hughes Act was passed by Congress in 1917. The amount of money provided for distribution to the states for the school year 1917-18 was $1,500,000. By the original Act the appropriation provided increases each year for eight years.

Of the $7,000,000 there is alloted for agricultural education, $3,000,000; for trades and education for industries, $3,000,000; and for teacher training, $1,000,000. All of the Federal appropriation has never been used by the states. The first year it was available, approximately 50 per cent was used. By 1921 and in each succeeding year, except 1925, approximately 93 per cent was used. In 1925 but 91 per cent was used.

A feature of the Smith-Hughes Act is the "50-50" principle by which states to share in the Federal appropriation must provide an equal amount either from state funds or local funds inside the state. This principle has been included in several other recent Federal acts and proposed in many, as in the Smith-Towner department of education bill, for instance. How it has worked out in this vocational education act is, therefore, an indication of how it may be expected to work out in other cases.

In 1918, for each dollar of Federal money expended in vocational schools under the provisions of the Smith-

Hughes Act, the states and local school districts expended $2.66; in 1919, $2.17; in 1921, $2.80; in 1923, $2.98; in 1925, $2.73. It is evident that the states have more than matched the Federal dollar.

The Civilian Vocational Rehabilitation Act passed in 1920, is also a fifty-fifty proposition. It is also administered by the Federal Board for Vocational Education. It is for the reeducation of persons injured in industries, the Federal money being used to encourage and assist the states in this work.

Thirty-six states have accepted the Federal act and participate in the appropriation. The total Federal money paid out to these 36 states for the past year was $519,535. State and local funds have been provided on the same projects by the 36 states amounting to $670,387. This more than balances the Federal appropriation, but when the figures for each state are studied it is found that in 21 of the 36 states the state and local funds just equal or practically equal the Federal allotment. The Federal Dollar has been matched, but the states have not been encouraged to expend much more than just enough to secure the Federal money.

SELLING VOCATIONAL AGRICULTURE IN HAWAII

James R. Coxen, Director of Vocational Education, Territory of Hawaii

In many sections of the Territory of Hawaii the only crop grown on a commercial basis is sugar cane. There is almost no market for any other crop, so the production of cane is practically the only agricultural occupation. The practice followed is that of planting the cane about once in six years or more. The first crop, known as the plant crop, matures in about eighteen months and is then harvested. After that the other crops, known as ratoon crops, grow from the roots. These also require about eighteen months to mature. In some instances cane fields which were planted 25 years ago are still producing, but in general the production decreases with each crop after the second or third. When three or four crops have been harvested, the field is usually re-planted. The work of clearing and ploughing the fields and of planting the cane is very expensive so that the chief profit comes from the ratoon crops. The principal expense in producing these crops is the cost of fertilizing, irrigating, cultivating, and harvesting.

In the Hilo high school, vocational agriculture was introduced in September, 1925. Work in the cane fields is rather hot and strenuous and does not appeal greatly to boys who know what it means. In an effort to show boys the possibility of growing cane as a business proposition, Mr. W. W. Beers, the agricultural teacher, had his class obtain figures as to the cost of producing cane and also as to the probable returns. The boys secured figures from their parents, from neighbors, and from the plantations. Since the profits from cane are secured largely from the ratoon crops, they prepared figures covering a three crop period. In this section the rainfall is heavy and no irrigation is required. The figures obtained by the class were as follows:

HAWAIIAN SCHOOL BOYS WORKING ON CLASS PROJECT IN SUGAR CANE.
Mr. James R. Coxen of Honolulu, Instructor.

Costs per Acre

Operations	Plant Crop	First Ratoon	Second Ratoon
Clearing and Ploughing	$ 70	No Cost	No Cost
Seed cane, and Planting	18	No Cost	No Cost
Fertilizing	60	$ 60	$ 60
Cultivating	25	45	45
Harvesting (estimated 60 tons at $1.25 per ton	75	75	75
Total cost per acre	$248	$180	$ 180
Total cost per acre for three crops			$ 608
Returns per Acre			
Estimated 60 tons @ $5.60	$336	$336	$ 336
Total estimated returns for three crops			1,008
Total estimated profit for three crops			400
Average profit per acre per crop			133

The above estimates were based on figures obtained in that section and no allowance was made for rent on land or for interest on money invested in the land. Neither was any allowance made for depreciation of equipment, but this would be a very small item since the work of clearing and plowing the land and of harvesting the cane is done by the plantations at a fixed price. The equipment needed for the other operations is comparatively inexpensive. The estimated profit does not include the wages earned in growing the crop. One man can care for from six to nine acres of cane, but this will keep him busy for only about half of the year. During the remainder of his time he can usually secure work in the sugar mills or at some other occupation so that he has an opportunity to increase his yearly earnings. The prospects seemed to appeal to the boys and 22 boys enrolled for the work. Fourteen of them have taken cane projects to be carried on in connection with their school work and other projects will be taken up later.

Household Mechanics Course. The board of education at Dundee, Ill., has introduced a course in household mechanics, to replace the woodworking and mechanical drawing work. The course seeks to develop ability in the use of tools, and to teach the operation and repair of mechanical devices, and the work is specific and practical. The course is as follows:

Woodwork: To make a wooden miter box, to strengthen a joint with corrugated fasteners, to make an awl from a broomstick and a 10d nail, to attach a corner plate, corner brace, and mending plate to a joint, to put cross partitions in a drawer, to make a cellar window screen, to remove the sash from a double hung window frame.

Wood Finishing: To stain, fill and varnish over new wood.

General: To make a joint in a round leather belt, to glaze a pane of glass in a window sash, to frame a picture, to make a small table lamp.

Sheet Metal: To tin a soldering copper, to mend holes in a piece of sheet metal or a cooking utensil, to make a holder for an electrical heating element, using tinner's rivets in the joints, to make a sugar scoop from a tin can, to make a cookie cutter from a tin plate.

Bench Metal: To make a pawl for a lawn mower, to replace a broken spring in a mortise lock, to file a key for a common door lock, to sharpen and adjust a lawn mower, to make a metal corner brace for a shelf.

Plumbing: To recognize and re-washer a leaking compression faucet, to put a new fuller ball in a fuller faucet, to re-washer and re-seat a self-closing faucet, to cut and thread a piece of pipe, to assemble the pipe fittings commonly found in the home.

Electricity: To make an end splice and a tap splice in No. 14 National.

Electric Code Wire: To wire up one door bell, one push button, and one dry cell, to wire a bell circuit that will operate two bells with one push button. To hook up a bell and buzzer that operate on separate push buttons but use the same battery. To replace and refill a burned-out fuse. To make an extension cord for an electric lamp. To assemble an attachment cord of an electric appliance of the home. To install a feed through switch in the attachment cord of an electrical appliance of the home. To make an electrical heating element. To make a transformer that will give six volts when attached to the 110 volt A. C. line.

Concrete: To make some concrete blocks (dry mix).

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, pattern-making, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration.

THE SCOOTER

A. J. Goldborg, Hibbing, Minnesota

(See Supplement No. 9.)

This problem was designed as a supplementary problem to take care of the faster boys. It was given out in the Spring of the year and was well liked.

The construction of it carries no difficulties in the making. Care must be taken in screwing the screws in hardwood. The holes must be drilled in line, particularly so for the dowel supports for the wheel.

The bearing dowel was soaked in oil in order to harden it.

The average seventh grades should have no trouble in making it.

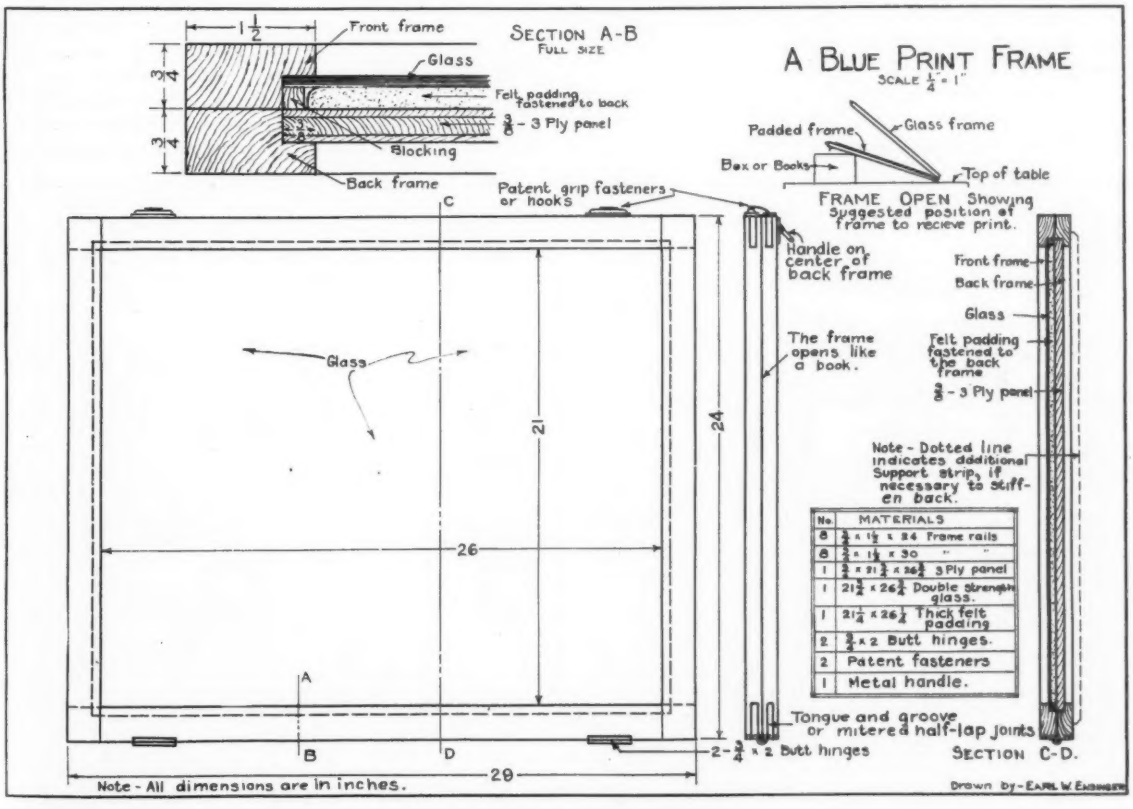
A BLUE PRINT FRAME

Senior in Manual Arts Section, Bradley Polytechnic Institute, Peoria, Illinois

The blue print frame shown in the drawing is much lighter and can be more easily handled than the usual commercial frame, but it does equally good work. It has the added advantage of allowing the operator to see the exact position of the print while it is being placed in the frame. The frame opens like a book; it is made of two simple frames, one with glass in it and the other having a padded plywood panel in it. (See the sketch in the upper right-hand corner of the drawing.) The frame shown is of medium size, but a smaller or a larger one can be patterned after it. It is not advisable to make a frame larger than 36"x48" unless heavy glass is used.

The construction of this frame is very simple and can easily be undertaken in any manual training shop. It consists of two frames made of ¾"x1½" stock, with a ⅜" rabbet cut out of the inside corner. Each one of the two frames should be put together with either tongue-and-groove or mitered half-lap joints, which should be reinforced by three or four screws throughout each joint. A good piece of double strength glass should be fastened in one frame with small blocking strips. A good quality piece of ⅜" plywood paneling should be glued and nailed in the other frame. These two frames should be hinged together along the bottom long edge, with two ¾"x2" butt hinges. Two patent grip fasteners or hooks should be put on the top long edge. These fasteners can be any kind which will provide easy opening, and still hold the frame tightly closed.

The making up of the padding is the only difficult job, and this must be very carefully done so as to get even pressure on all places. The following method has obtained good results in making an even padding for the frames. Start by padding up the center of the frame with several thicknesses of heavy detail paper and glue them to the plywood panel back. Make the first piece of paper about two inches smaller each way than the inside of the glass frame, and the rest of the pieces that


SECTION A-B
FULL SIZE
Front frame
Glass
Felt padding fastened to back
⅜ - 3 Ply panel
Blocking
Back frame
A BLUE PRINT FRAME
SCALE ¼ = 1"
Padded frame
Glass frame
Box or Books
Top of table
FRAME OPEN Showing Suggested position of frame to recieve print.
Patent grip fasteners or hooks
Handle on center of back frame
Front frame
Back frame
Glass
Felt padding fastened to the back frame
⅜ - 3 Ply panel
The frame opens like a book.
Note - Dotted line indicates additional Support strip, if necessary to Stiffen back.
Glass
21
24
26
20
A
B
C
D
2 - ¾ x 2 Butt hinges
Tongue and groove or mitered half-lap joints
SECTION C-D.
Note - All dimensions are in inches.
Drawn By - EARL W. ENGINEER
No. MATERIALS
8 ¾ x 1½ x 24 Frame rails
8 ¾ x 1½ x 30 " "
1 ¾ x 21¾ x 26¾ 3 Ply panel
1 21¾ x 26¾ Double Strength glass.
1 21¾ x 26¾ Thick felt padding
2 ¾ x 2 Butt hinges.
2 Patent fasteners
1 Metal handle.

DETAILS OF THE BLUE PRINT FRAME.

much smaller than the first, until the center is somewhat higher than the edges. This padding of the center is done to compensate for the bending of the glass. Care should be taken to not get too much of a raise; about 1/16" to 1/8" is enough for this frame. The center part of the padding will thus touch the glass first and tend to press out the air from between the tracing and the print paper. The best padding is made of heavy felt which can be obtained at any upholstery shop. Some experimenting should be done to get the frame to print clearly in all places. If there are spots where the print is blurred, a thickness or two of paper glued down under these will bring them out. When the pad is arranged so that it prints perfectly, put a little glue under the edges of the felt and tack it down. A binder strip of adhesive tape should be put around the edge of the felt and the tacks nailed through it.

Aside from the construction of the frame itself, a few suggestions as to methods of using it may prove helpful. As is suggested in the sketch in the upper right-hand corner of the drawing, when putting in the prints, place the frame on a slant by leaning it upon some books or a small box. To facilitate getting the print in the frame, roll the tracing in the print paper, but retain a hold of the edge of both, with the fingers. Open the frame just enough to allow the paper to unroll down the incline of the padding. Usually the very bottom of the paper will coil up a little, but this can best be smoothed out by pulling back on the paper as the top glass frame is laid down on it. It is possible to change prints in the frame very rapidly after a little practice on this method. This frame allows the operator to see the exact position of the print at all times. It works equally well for printing several small prints at a time as it does for one or two. Simply put in the large sheet of blue print paper and slide the bottom row of tracings down in position, and then let the glass down on them a little and slide in the top row.

The matter of timing of the prints when printing by sunlight is always a rather difficult job and usually is little better than guesswork at the best, because the strength of the sunlight varies so much. The following is a little practice picked up in an architect's office, which is worth passing on. Slightly moisten the tip of a finger and touch a spot on the blue print paper outside of the tracing, before exposing it to the sun. As soon as the print is placed in the sunlight this spot will turn a very dark blue, and then in time it will begin to turn gray. When it gets to be an even dark gray color it is ready to bring in out of the light. Do not go by the white spots which sometimes appear in the blue, for they are usually due to too much moisture—wait until the entire spot becomes an even gray. A little experimenting will be necessary to find just what shade of gray will be required for the particular paper used. I have had high school boys learn to print by this method very quickly and accurately, and have obtained better results than from timing with a watch. It does not matter how strong, how weak, or how irregular the sunlight is; just allow it to print until the spot is the right shade of gray and the print will be good. It is better to over-expose the print a little than to under-expose it, because slightly over-exposed print will not fade in the light.

OVERHEAD TRAVELING CRANE

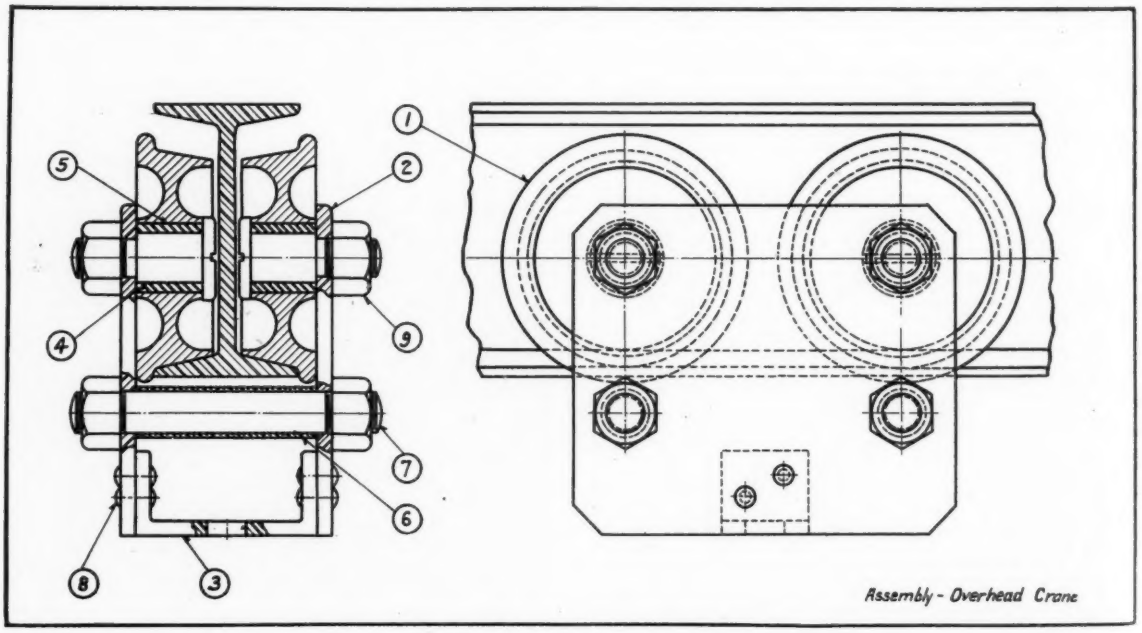
J. A. Miller, New Kensington, Pennsylvania

The overhead crane shown on the accompanying drawings is a very interesting project for the machine-shop class and one that can be used to good advantage as a part of the equipment when finished.

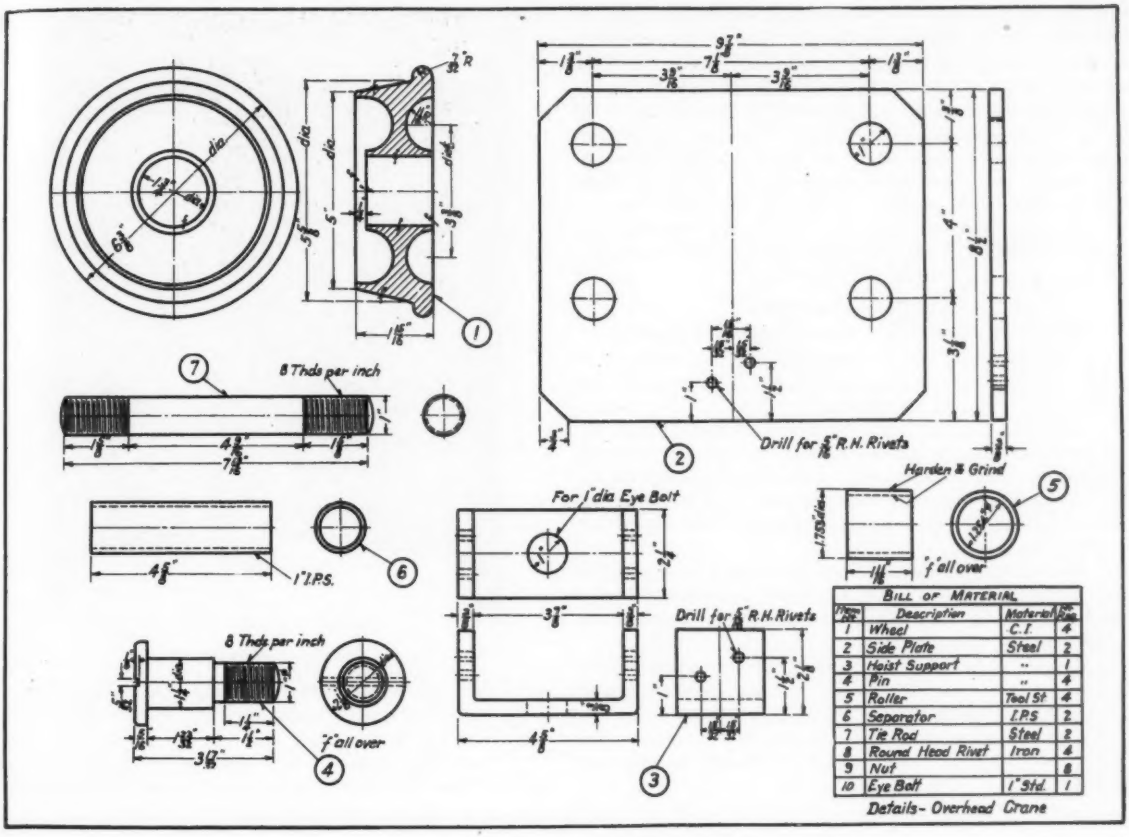
The seven-inch I-beam which is used for a track, is fastened to the I-beams supporting the floor above. The wheels of the crane are designed so that the face has a perfect bearing on the upper side of the I-beam's lower flange.

A roller, or bushing, of tool steel is hardened, ground and driven into the wheel which revolves on the pin.

Care should be taken in assembling. It is advisable not to cut the 1" I. P. S. tubing which acts as a separator or to shape the hoist support until the last operation. For, if a slight error is made by the student in machining the wheels, the 1/32" clearance allowed between the wheels and side plate is likely to be lost, thereby binding them.



ASSEMBLY DETAILS OF OVERHEAD CRANE.



BILL OF MATERIAL

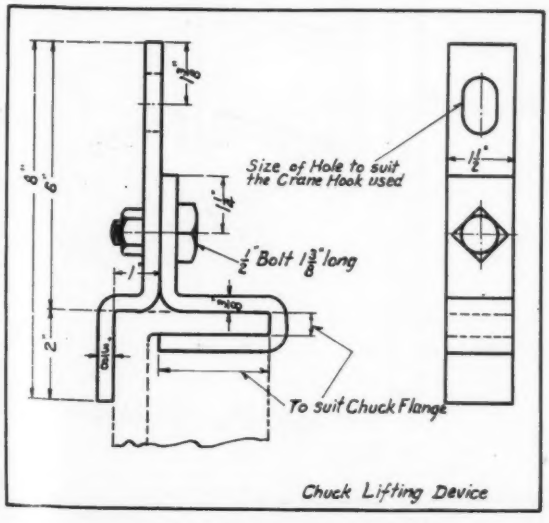
No.	Description	Material	No. Req'd
1	Wheel	C.I.	4
2	Side Plate	Steel	2
3	Hoist Support	"	1
4	Pin	"	4
5	Roller	Tool St	4
6	Separator	I.P.S	2
7	Tie Rod	Steel	2
8	Round Head Rivet	Iron	4
9	Nut		8
10	Eye Bolt	1" Std.	1

DETAILS OF OVERHEAD CRANE.

From the opening in the hoist support, the chain hoist is suspended, using a 1" standard eye bolt with lock nuts attached.

A chain hoist with a capacity of 2,000 pounds similar to the Bestovall screw hoist H-10 is ideal for this project.

The crane is valuable for handling heavy chucks, large face plates and other heavy material to be machined. It can be arranged to pass directly over the longitudinal center line of the machines (if motor driven) or at right angles if more convenient.



DETAILS OF CHUCK LIFTING DEVICE.

One advantage in having a crane of this type in the school shop is that when not in use, it can easily be kept out of the way of students who are operating machines.

CHUCK LIFTING DEVICE

J. A. Miller, New Kensington, Pa.

A chuck lifting device can be very easily constructed and will be found quite useful in shops where the type of work handled by large machines make it necessary to use cranes for the heavy work.

Form two pieces of steel as shown in the drawing. Place over flange of chuck and tighten up the ½" bolt.

MAKING CLOSE-REGISTER LINOLEUM BLOCKS

R. A. Loomis, Jersey City, N. J.

Registering linoleum blocks for two or more colors has caused the writer considerable trouble in the past. The following method was successfully carried out in the print shop.

I wished to make cuts for a two-color football poster. Part was to be printed in black and part in red. The plates were to strike in fairly close.

The poster was designed in the regular way in colors as it would appear when printed. The key plate which was represented by the black plate, in this poster, was transferred to the mounted linoleum. This plate was carefully cut and proved up on the printing press on which it was to be printed.

Now, in order to get a close clean-cut design from which to cut the plate for the red color, a strong, fully inked impression of the key plate was made on the tympan sheet of the press. Then the piece of unmounted linoleum which was to be used for the red plate was placed face against the printed tympan sheet and the press, with the key plate still in its original position in the chase, was brought together as if to print on the back of the linoleum

that had been placed on the tympan sheet and thus an offset impression was made on the face of the linoleum. Of course, the press could not be turned all the way over as in printing a full impression, because linoleum is too thick. It was brought together just as heavily as could be by hand and then turned back. This gave a perfect impression, in reverse, right in place on the linoleum. The design was transferred perfectly and obviously more quickly than could possibly be done in any other way.

All that was necessary was to let the ink dry and follow the design of the key plate, paint in the color plate as wanted, and go ahead and cut it out.

A SEWING SCREEN

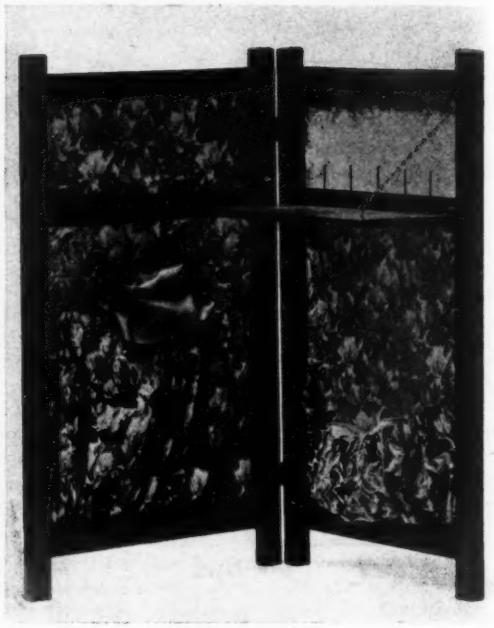
Alfred S. Madsen, State Normal School, Milwaukee

Some years ago at a teachers' meeting, methods of raising money were discussed in order to "put over" the Junior Red Cross in our school.

Some of the academic teachers suggested that the manual training department make toys and sell them for Christmas. The writer, after some thought, dropped the idea of toys, as the time was too short and selected the sewing screen illustrated as the problem best suited for production.

An eighth grade class of twenty boys was selected to do the work, jigs were made, the class was organized on a production basis, and the screens were made in a few weeks.

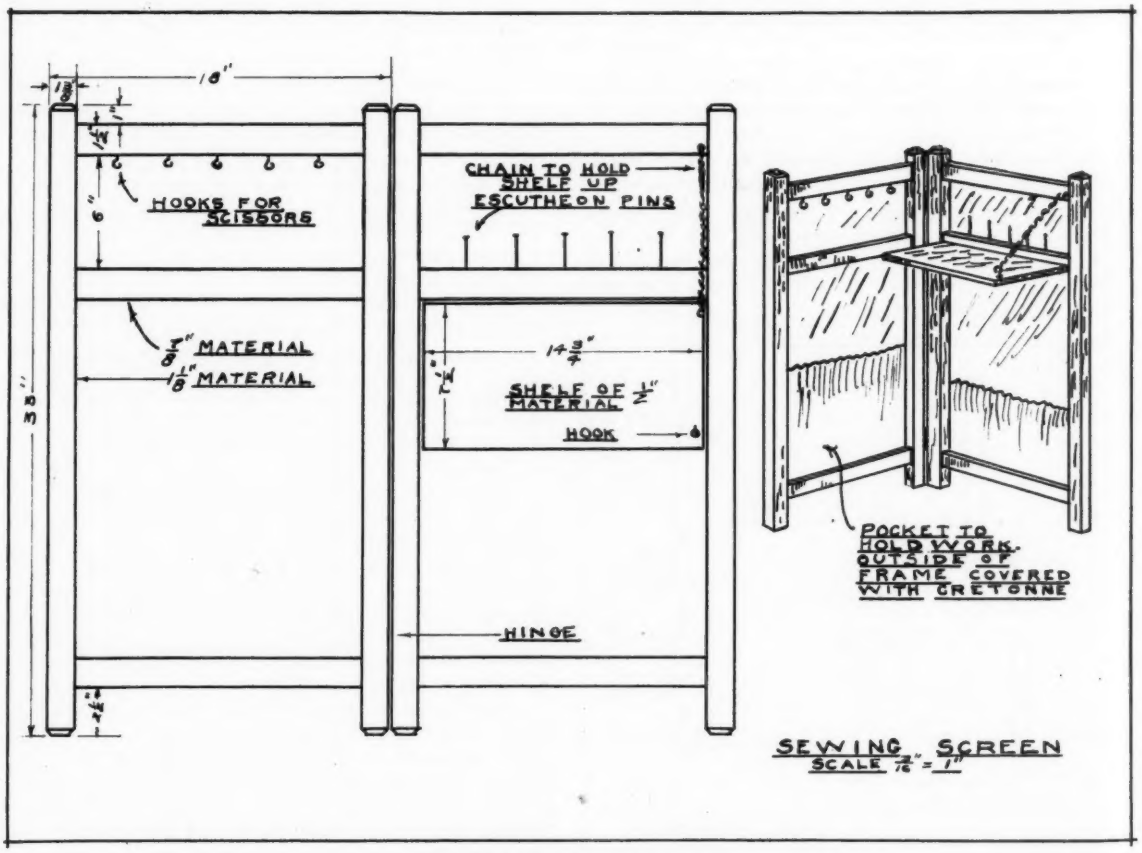
Remnants of cretonne were purchased at a department store to cover the screens, and the girls in one of the sewing classes hemmed one edge of the pockets for the elastic. When the first screen was finished it was sent to the different rooms for inspection and orders were taken.



SEWING SCREEN.

Thirty-six screens were made and sold at three dollars each, realizing a nice profit, and the Junior Red Cross went over one hundred per cent.

The sewing screen is a handy piece of furniture to have around the small apartment as well as the larger



DETAILS OF SEWING SCREEN.

home. It can be carried out on the porch in pleasant weather and takes up very little room when not in use.

The frames are made of any hardwood, the legs are 1⅛" by 1⅜", rails ¾" by 1½", and the shelf is ½" material.

Dowel all rails, using two dowels for each joint. Finish as desired. After finishing, hinge the frames and shelf; attach the chain cuphooks and escutcheon pins. Cretonne is used for the pockets and the outside of the frames. The two pockets are tacked to the outside of frames, and the cretonne is then tacked on over the pockets. Gimp is nailed on all around to finish the edge.

HOW TO FIT AN ICE SAW

L. M. Roehl, Ithaca, N. Y.

There are different ways of filing ice saws. Two ways are illustrated in the following drawings. Fig. 1 illustrates the shape of the teeth as made by one well-known manufacturer and Fig. 4 that of another. The teeth in Fig. 1 are very similar to those of the timber saw, while those in Fig. 4 more closely resemble the teeth of a hand rip saw.

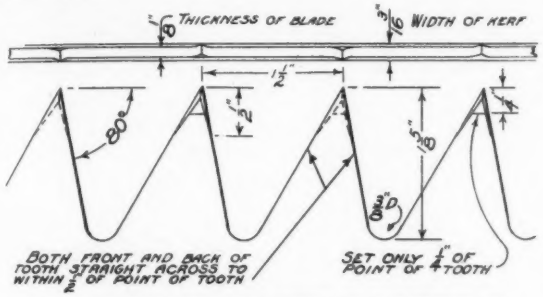

THICKNESS OF BLADE
WIDTH OF KERF
1½"
80°
BOTH FRONT AND BACK OF TOOTH STRAIGHT ACROSS TO WITHIN ½ OF POINT OF TOOTH
SET ONLY ¼ OF POINT OF TOOTH

FIG. 1. ACTUAL SIZE AND SHAPE OF THE TEETH OF AN ICE SAW.

The first thing to do in fitting an ice saw is to joint it. This is done by running the side of a flat file lengthwise of the saw over the teeth. The purpose of jointing the saw is to bring all points to a line so that all teeth will do an equal amount of work. Unless this is done, the teeth which have become shorter due to abuse or poor filing, will be back from where the cutting is to be done, and the saw will not cut as fast or as well as it should.

The teeth of the saw shown in Fig. 1 are 1⅝" long and 1½" between points. The fronts of the teeth are about 80° to a line along the points of the teeth. See Fig. 1. This angle may be tested by the use of a steel square and T bevel. Set the T bevel at 1" on the tongue and 5½" on the blade of the steel square, as shown in Fig. 2.

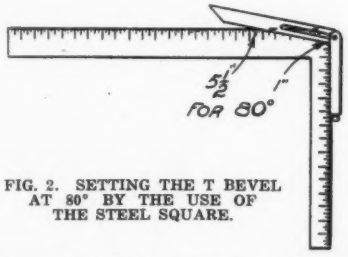


FIG. 2. SETTING THE T BEVEL AT 80° BY THE USE OF THE STEEL SQUARE.

Both the front and back of each tooth is made straight across or at right angles to the sides up to within ½" of the point of the tooth.

In filing, only ½" of the tip is filed. The file is not allowed to run down on either front or back of the tooth more than ½".

The bevels at both front and back of a tooth are alike, and that is about 72°. This bevel or angle may also be obtained by use of the steel square and T bevel. Place the T bevel at 1" on the tongue and 2½" on the blade of the steel square as shown in Fig. 3.

Every other tooth is filed from one side and the rest from the other side. The file is held against the tooth for filing both front and back at the angle shown by the T bevel in Fig. 3.

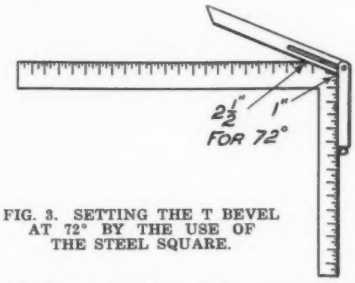


FIG. 3. SETTING THE T BEVEL AT 72° BY THE USE OF THE STEEL SQUARE.

The filing is continued until the flat surface which has been caused on the tips of the teeth by jointing has been filed away and a sharp point has been made. One must be sure to stop filing when a point has been made, as a stroke of the file after the point has been reached will bring the point of the tooth below the others and it can not do its share of the cutting.

Each alternate tooth is set to one side and the others in the opposite direction, so as to make a saw kerf wider than the thickness of the saw blade which is about ⅛" on a large saw. The set is short and abrupt. Only about ¼" of the point of each tooth is set. Enough set is given the teeth to make a saw kerf about 3/16" wide. See top view, Fig. 1. The spring set which is used in setting timber saws or a hammer and anvil set may be used.

The blade of the saw in Fig. 4 is ⅛" thick. Enough set is given the teeth to make a saw kerf nearly 3/16". The lines in the top views of Figs. 1 and 4 show the actual thickness of the saw blade and the width of the saw kerf.

Fig. 4 shows the size and shape of the teeth of an ice saw as made by another manufacturer. This shape is quite different from the one shown in Fig. 1. The teeth resemble closely those of the hand rip saw.

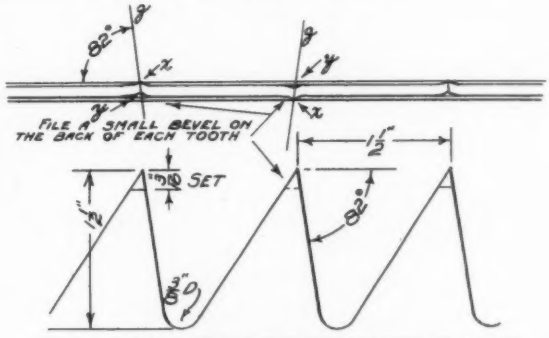


FIG. 4. ACTUAL SIZE AND SHAPE OF THE TEETH OF AN ICE SAW.

After the saw is jointed both fronts and backs of teeth are filed straight across to a point, then a slight bevel is filed on the back of each tooth, so that the point marked "x" above will be slightly above points marked "y" after the saw is set.

It will be noted in Fig. 4 that the fronts of the teeth are at 82° to a line along the points of the teeth. This angle may be tested with the T bevel set at ¾" on the tongue and 5½" on the blade of the steel square in the manner shown in Figs. 2 and 3.

After the saw is jointed, both fronts and backs of teeth are filed straight across the blade, bringing the teeth to an edge, much like a wood chisel. Then a slight bevel

is filed on the back of each tooth so that the points marked "x" in Fig. 4 will be slightly above points marked "y" after the saw is set.

The angle at which this bevel is filed is about 82°, and the position for direction of file is shown by lines marked "z" in Fig. 4.

The set on this saw is shorter—hence more abrupt—than the one in Fig. 1. It should not be less than ⅛" nor more than 3/16". It may be made or done with the timber spring set or an anvil set. A good anvil for setting saws can easily be made from an old sad iron or other rather heavy block of iron by filing the desired bevel at one end or edge.

THE ADVANTAGES OF CASEIN GLUE

C. F. Winant, Industrial Chemist, Albany, New York.

Articles have occasionally appeared in various periodicals seeking to enlighten glue users as to the merits of certain kinds of glue. It is noticeable that one of the most important phases of the glue question is not mentioned—the question of the effect of dry heat on glue.

It is a well known fact that dry heat is one of the greatest enemies of glues and a discussion of it in connection with glue is often purposely omitted for the reason that the glue being discussed could not combat it.

Numerous articles have set forth the strength of various glues and others the ease of preparation; others that the glue will stand boiling for a certain period of time. The boiling test, it is pointed out, is not an actual condition, as instances are rare indeed where woodwork is subject to boiling.

It requires considerable time to prepare flake glues for use. Casein glues must be stirred for five minutes, then allowed to set for ten minutes, then stirred once again, and if more than the amount actually needed for immediate use is mixed up, it is wasted. Fish glues, while perhaps in most convenient form for ready use, are not practical for woodwork as they are easily affected by both dry heat and dampness, and because of the enormous waste from evaporation in the can.

There is, however, a hot animal compound glue which requires only a few minutes' heating to prepare it for use. There is no mixing or waste, as it will not dry up in the can or deteriorate in any way. This glue is subjected to exhaustive comparative tests and is absolutely proof against dry heat and all other atmospheric conditions to which furniture and woodwork are subjected.

This hot animal compound glue has a strength which averages over 3,200 pounds shear test. It is very economical to use as there is no waste, no sticking to the sides of the pot, and no souring as flake glues often do. It will not dry up in the can when not in use, as do fish glues. and there is no waste from mixing too much, as in the case with casein glues.

For ordinary work, it is necessary to apply the glue to only one side of the joint, which means a large saving. The price of the glue is no more than the price of ordinary fish glues on the market, and its quality has been positively proven.

Industrial Arts Vocabulary

F. S. Crispin, Philadelphia, Pa.

Dash Pot—A small cylinder which with its piston absorbs a part of the shock in the quick closing of steam and exhaust valves of Corliss engines.

Datum—A point of reference.

Datum Line—Any base or fundamental line from which dimensions are taken or graphic calculations made.

Dead Level—An emphatic expression in the sense of absolutely level.

Dead Load—A load whose pressure is steady and constant.

Dead Smooth File—The finest cut file made.

Decarburization—The removal of carbon from combination with metals in the processes of the manufacture of malleable iron, etc.

Decimal—A method of expressing a fractional part as by tenths or hundredths.

Decimal Equivalent—The value of a fraction expressed in decimal form.

Dedendum—That portion of a gear tooth which lies between the pitch and root line.

Deflection—(Arch.) The bending of a beam or structure under an applied load.

Deformation—(Arch.) The alteration in form which a structure undergoes when subjected to the action of a load, the load producing either an elastic strain or a permanent set.

Degree—A 360th part of a circumference of a circle.

Delineate—To portray; to draw out.

Demy Drawing Paper—Name given to drawing paper measuring 20 in. by 15 in.

Denomination—A class or division.

Dentils—(Arch.) Small oblong blocks in a cornice.

Depth Gauge—A gauge used by wood and metal workers for testing the depth of holes and recessed portions.

Depreciation—The loss in value which machinery sustains with age and through wear and tear.

Describe—To trace out; set forth; narrate; to draw.

Description—An account of anything in words or writing.

Design—The drawing out of a machine or structure; the working out of mechanical ideas.

Detail—A separately considered portion of anything; one of the constituent parts.

Detail Drawing—One which is not an assembly drawing but embraces some portion or section only of the machine.

Determine—To find the value of, mathematically, by exact measurement.

Detonator—A cap in which a spark on an electrically heated wire sets off an explosive charge with sufficient violence to explode a greater charge of dynamite.

Develop—To unfold gradually; make known in detail; to draw a pattern of.

Development—Gradual growth or enlargement. A drawing representing a pattern or lay out.

Diagonal—Extending from one angle to another; a straight oblique line such as would divide a rectangular figure into equal parts.

Diagonals—(Arch.) Bracings placed at an angle across rectangular framings to prevent deformation taking place in the shape of the frames. The braces, struts and ties of a lattice girder are its diagonals.

Diagonally—Obliquely; inclined.

Diagram—An outline drawing, or graphic representation.

Dial Gauge—A dial having an index hand actuated by a bent spring, through which the amount of pressure, or of vacuum, is indicated; the dial being graduated accordingly. All gauges of this kind are made on Bourbon's spring principle.

Diameter—A straight line passing through the center of a circle, its ends terminating in the circumference.

Diametral Pitch—The relation between the number of teeth on a gear and the diameter of the pitch circle.

Diaper—A form of surface decoration used in art and architecture consisting of geometric designs, etc.

Die—An internal screw used for cutting outside screw threads; a formed piece used in stamping out similar parts for quantity production.

Die Forging—The making of forgings in dies in quantity work to secure a better product at low cost.

Diesel Engine — An internal combustion engine of high efficiency in which a high temperature is obtained by high compression of the air, and the oil is ignited by the heat thus developed.

Differentiate—To constitute a difference between; a mark distinguishing from.

Mr. H. L. Mahnke, high school printing instructor at Superior, Wis., has been elected as the first president of the Central Association of Printing Teachers, formed at the recent Central Interscholastic Press Association. Mr. Mahnke has been a leader in the organization of the association and was chairman of the committee which had charge of the planning of the organization.

Besides Mr. Mahnke, the other officers are: Vice-president, W. R. Baker, Waukegan, Ill.; secretary-treasurer, H. G. Bergner, Madison, Wis.; C. W. Hague, Stout Institute, Menomonie, Wis.; R. M. Still, Fargo, N. D., and Henry Douma, Muskegon, Mich., directors.

The association has a membership of 35 printing instructors and meets annually at Madison, to discuss topics of interest to the profession.

CHARLES E. JONES, PIONEER MANUAL TRAINING INSTRUCTOR

Charles P. Coates, Los Angeles

From a New Year's letter written by one of the St. Louis teachers I learn that, during the past year, the Grand Artificer called from our ranks a figure of considerable interest. Charles E. Jones was one of the first shop instructors selected by Calvin M. Woodward for his **Pioneer Manual Training High School** and was, at the advanced age of eighty-four years, the oldest active manual training teacher in the public schools of this country.

Not long ago Mr. Jones told me that he was born at Leeds, England, on May 18, 1841, and that when he was but seven years of age, his parents decided to try their fortunes in America. After an eventful eleven weeks aboard a sailing vessel, the family reached New Orleans. From there passage was secured on the famous river-

CHARLES E. JONES.

packet, "The Grand Turk" for St. Louis. He told me, too, that his early education was obtained in the St. Louis Schools; he being one of the first pupils to enroll at the old Benton High School. His practical education was begun in the small lean-to forge shop that his father, a "mechanical engineer," had salvaged from the banks of the Mississippi. A livelihood for the family was assured by the constant demand for hand-forged ox chains used by the "log-snakers" along the river. After serving an apprenticeship in the machine shop of a firm of founders, Gaty-McCune & Co., Mr. Jones worked at his chosen trade for a number of years. At the close of the Civil War he "followed the river—working as a striker and engineer on the packets plying the Mississippi, Missouri and Tennessee channels." In October, 1879, he entered the service of Washington University as an engineer in charge of installation and care of the steam heating unit—at that time the only example of its kind west of Lockport, New York. Professor Charles A. Smith was interested in the heating unit and in the several young men who were in charge of power plants about the city. For the benefit of this group an "extension" class was organized by him, and, needless to say, Mr. Jones enrolled. In November, 1894, he was admitted to membership in the American Society of Mechanical Engineers.

It was Mr. Jones' adaptability, his ability to teach others, and his genial character that induced Professor Woodward to secure his transfer from the position of Corliss engineer of the Manual Training School building to that of instructor of forging. This position he filled with credit to himself and with honor to the University. When the Manual Training School united with Smith Academy, he was retained; when Smith-Manual, in turn, was disbanded, he secured a position as instructor in the new Ben Blewett junior high school—an institution conducted by the board of education of St. Louis.

Over forty years ago Professor Woodward's book, "The Manual Training School," contained an illustration of Mr. Jones at his forge and in the center of a semicircle of interested boys. "Imagine him," said Professor Woodward, "suiting the action to the word with a force and fitness which Hamlet never dreamed of." Forty years ago, yet only last June he demonstrated with ease the principles of the heat treatment of steel at the forge.

VOCATIONAL EDUCATION SOCIETY OF BOSTON HOLDS MEETING

Dr. Charles A. Prosser, director of Dunwoody Institute, Minnapolis, and formerly director of vocational education in Massachusetts, was the speaker and guest of honor at the annual get-together meeting of the Boston Society, held Saturday evening, January 9th, at the Hotel Westminster. There was a record attendance of 115 members and guests. Community singing between the courses, and musical and monologue entertainers contributed much gaiety to the occasion.

Dr. Prosser spoke feelingly of the pleasant years which he spent in this state, and of the cordial relations he had enjoyed with educators here, many of whom he recognized as being present. He referred in particular to three men who would always remain prominent in his recollections of his years here: William C. Crawford, principal of the Boston Trade School, "a pioneer, a rock in defence of vocational education;" A. H. Morrison, head master of Mechanic Arts High School; and Frank V. Thompson, late superintendent of schools of the city of Boston, whose death, occurring in the very prime of his usefulness, was a real tragedy for Boston and for the cause of education in this country.

The speaker commented on the inclusiveness of aim which characterizes the Boston Vocational Education Society. In its membership are representatives of manual training, prevocational, technical, trade preparatory, co-operative, trade extension and continuation school education. It is a wise thing, said he, to realize the applicability of Franklin's injunction that we must "Hang together or we will hang separately;" and it is a healthy trend which marks the ending of the schisms which formerly split into opposing forces the men interested in these various types of practical education, and set the manual training advocate against the industrial educationist. Dr. Prosser confessed to having been a "party to the crime" in former days when industrial education was a weak infant requiring careful nurture to be brought up in the way it should go. It was not, said he, that there was anything the matter with manual training; only that there had existed a danger of its warping if not engulfing the newer type of education. This danger has now passed; the time has come when not only we but the public whom we serve realize the place of each type of practical education. We are thus in a position now to get a true view of the things which we have in common, and to drop the emphasis on our differences.

These common aims are, after all, the important aims. There are scores of definitions of the purpose of manual training; and the speaker was not inclined to make a hair-splitting examination of them. He did state his belief that the prevocational purpose—the giving of various types of shop experience as a selective base for a future vocation—is hardly justifiable.

Two essential features of manual training, however, must pervade all successful teaching of it; and, not at all strangely, they are equally characteristic of industrial education and indeed of every type of the "practical" education. These are, first, the providing of new forms of expression other than those of ear, eye and pen, which for so long held the unyielding grip of tradition on our school curricula.

The second purpose of manual education is to teach pupils to think. It is not a paradox to say that this can be most effectively done outside the "book" subjects. All of us get our real training in thinking from practical life, from the solving of practical problems, in which the results give a positive test of the validity of the thinking. There are very few things in present-day education which admit that sort of thought-training and manual and vocational education are prominent among the few.

Recognition of this principle, however, points a warning which must be heeded. The teacher who thinks for his pupils, who plans the exercises and projects, who smoothes the difficulties from their paths and leaves them only the manipulative work to do, is vitiating the very purpose of the training. The teacher who merely shows, tells, and encourages the pupils to imitate him blindly, without digging and solving their own projects, is robbing youth of its privilege and his course of its reason for being.

This two-fold purpose providing new forms of expression, and teaching to think, is the common ground of manual training and industrial education. "Vocational education," said Dr. Prosser, "has the message of a new pedagogy for the regular schools."

Dr. Prosser brought a note of optimism in his statement that the rising sun of victory for practical education is now on the horizon. The struggles of early years brought fruition in the impetus which vocational education received in war time. But in the post-war reaction, in spite of the lessons learned, economy and other factors gave new life to the feeling that manual and vocational education were "fads"—even though Latin and solid geometry might not be so classed. The past two years have therefore been a critical period; but we have now weathered the storm. The swelling demand for practical education which functions in the affairs of life makes it inevitable that the work must go on and prosper. This demand is sufficiently indicated by figures which show that the present school year almost one million persons are taking advantage of the opportunities offered in state-aided and federal-aided vocational schools. To this figure should be added the 1,200,000 students enrolled in vocational courses offered by approximately six hundred correspondence schools in this country. If the beneficiaries of manual training classes, mechanic-arts high schools, and technical schools are added, we have a grand total of probably fifteen million people pursuing practical school training in a single year. The practical subjects are far too popular ever to be dropped.

Dr. Prosser prophesied that Massachusetts will in the not distant future revive in its own way the institution of apprenticeship. Like President Coolidge, he "has faith in Massachusetts," which started the vocational education movement in 1906, gave the impress of its ideas to federal legislation and to that of most of the states, and reserved sufficient impetus to go right ahead in continued progress. It has been a marvel, he said, that Massachusetts has prospered so in the face of economic handicaps. The state has no coal, no cotton, no leather; but it has superior economic intelligence. When Massachusetts loses that, she loses her all.

The speaker prophesied that increasing emphasis in the vocational program will be placed upon "earning and learning," through trade extension and cooperative part-time education. This type of training will become more and more a matter of adult education. The child leaving the public school at the age of 14 is not prepared for the complexity of life. He does not know facts, nor how to think with them when he gets them. Yet democracy depends upon the proper training of these youngsters in each generation.

The all-day trade preparatory school will remain; but it will be more and more a nucleus, a place from which to start a flight. Practical education through the medium of the schools will tend more and more to extend into the adult years. We shall revive the responsibility of the foreman in industry for the shop training of apprentices; and the related training will be given in part-time schools. Thus far, America has lagged behind many other countries, notably Great Britain, in the matter of education for adult workers, but a vast progress is due in this direction.

We are thus still only in the foothills of the vocational education movement, said Dr. Prosser. The hardest of the struggle is over. It is realized and firmly established in our educational creed that the man in the street has his rights and his needs; and that the greatest thing we can do for any individual is to train him in resourcefulness. We, teachers of practical education of every stripe, from manual training to trade extension, are part and parcel of a great work.

Others who spoke briefly were Dr. William C. Crawford. principal of Boston Trade School; Augustus Rose of Providence, R. I., a veteran in continuous membership in the Society; and Daniel H. Shay of the Massachusetts Department of Education, who told of the recent Cleveland meeting of the National Society for Vocational Education.

Handsome and useful souvenirs, contributed by publishers and manufacturers interested in vocational training, were distributed to all present—Frederick Ames Coates.

SCHOOL CRAFTS CLUB MEETING

The regular January meeting of the School Crafts Club of New York City was held at the Geneva Restaurant, 143 West 44th St., on Saturday evening, January 16th. The members got together for dinner at 6:15 p. m., the program beginning at 7:45 p. m., with two interesting and helpful speeches.

Mr. H. O. Mueller, special representative of the New York Telephone Co., gave an illustrated talk upon "The Transmission of Pictures by Wire." Mr. Mueller began his remarks by saying that "photographs are now being transmitted by telephotographic process directly from the negatives, the process of transmitting a photograph 5"x7" taking only seven minutes. A beam of light is made to pass through the negative and register the varying intensities of light and shade on a transmitter. The variations are sent electrically over wires to distant points and retranslated into another beam of light, which in turn makes a new negative.

It is already possible today, it was stated, to step up to a counter in New York with a picture and within a few hours have it delivered in San Francisco or Chicago, or both. The method of sending pictures by wire has now been made available for use by the public on an experimental basis. The telephotographic process, which was developed by the Bell Telephone System, has already been extensively employed in the transmission of photographs of all recent events of national importance for press publication. The method is now in daily use between three leading cities of the country.

The Problem of Picture Transmission

"The problem of directly transmitting drawings, figures, and photographs from one point to another by means of electricity has attracted the attention and curiosity of scientists and engineers for a long time," Mr. Mueller said. The broad principles of picture transmission have been known for many years. Before these principles could be reduced to successful practice, however, it was necessary to wait for the perfection of methods for the faithful transmission of electrical signals to long distances, and the development of special apparatus and methods which had become a part of the communication art only within the last few years. Some of these newer developments, for which the transmission of pictures had to wait, are the photoelectric cell, the vacuum tube amplifier, electrical filters and the use of carrier currents.

"Three essential things have to be taken into account. First, some means must be found for translating the lights and shades into some characteristic of an electric current. Second, there must be electrical transmission channels capable of carrying the characteristics of this electrical current faithfully to the required distance. Third, there must be a means for retranslating the electrical current as received into lights and shades, corresponding in relative values and positions with those of the original picture. In other words, we must know how to reduce the lights and shades in a picture to an electric current, carry this current a long distance accurately, and then translate it back into the lights and shades that make up the picture." This, Mr. Mueller said, was what had been done in building up the Bell System Method for transmitting pictures.

In a number of lantern slides, Mr. Mueller outlined in detail the Bell System process. For the purposes of explanation, a picture could be considered as divided into small squares which are sent over the wire. With their relative degree of light and shade and reassembled at the other end, the result would be a reproduction of the original picture sent.

How the Bell System Operates

In the Bell process the photograph to be sent is prepared as a film transparency and is bent into the form of a cylinder. The cylinder revolves and bounces on its axis, and as it does so a narrow beam of light one-hundredth of an inch in width, is traced around the cylinder in a long spiral, penetrates the transparency and falls upon a photoelectric cell, varies in intensity with the transmission or tone value of the picture. In other words, little light or a great deal of light will pass through, depending upon the proportion of black or white in the picture itself.

"The photoelectric cell used in picture transmission," Mr. Mueller said, "consists of a vacuum tube in which the cathode is an alkali metal such as potassium. When the narrow beam of light strikes this cell the alkali metal gives off electrons so that when the two electrodes are connected through an external circuit an electric current flows. This current is strong or weak, depending upon the amount of light passing through, and as the film cylinder is rotated and advanced, therefore, the illumination of the cell, and consequently the current arising from it, register in succession the brightness of each elementary area of the picture.

"This is done by means of vacuum tube amplifiers similar to those used in telephone repeaters whose output is impressed upon a vacuum modulator jointly with a carrier current whose frequency is about 1300 vibrations per second. What is carried over the wire of the telephone line, then, is the telephone carrier wave, modulated by the amplified output of the photoelectric cell, so that the currents in their frequency range and in amplitude are similar to the currents corresponding to ordinary speech.

"At the distant point it is necessary to have a device for retranslating this electric current into light and shade. This is accomplished by a device known as a light valve, which consists essentially of a narrow ribbon-like conductor, lying in a magnetic field in such a position as to cover entirely a small aperture. The incoming current passing through this ribbon is deflected up and down by the interaction of the current with the magnetic field, thus opening and closing the aperture. The amount of light passing through the aperture is thus varied in accordance with the magnitude of the received current and as it then falls upon a photographic sensitive film, bent into cylindrical form and rotating in exact synchronism with the film at the sending end, the film will be exposed by amounts of light carrying in proportion to the lights and shades of the original picture. The picture received can be developed in the usual way and a film negative or positive, nearly the exact duplicate of the one sent, is the result.

"Prints made from film negatives sent by the Bell System process, if the structure is chosen fine enough—about 100 lines to the inch or more—are closely similar in appearance to original photographic prints and may be reproduced through the ordinary halftone crossline screen. They may be retouched or subjected to special photographic procedures in any way desired.

A Notable Achievement

"The telephotographic process enabled the afternoon papers on the Pacific coast to use a picture of President Coolidge taking the oath of office on the same day. It was taken at 12:50 p. m., eastern time. Delivered to the picture transmission room in

Washington at 1:00 p. m. Transmitted at 1:57 and 25 prints were delivered to the press in San Francisco at 3:18, eastern time, or 12.18, Pacific time. It appeared on the streets in San Francisco at 12:33 Pacific time.

"One outstanding application to which the picture transmission system can be put is the transmission of news pictures for the press. An advantage of electrically transmitted pictures is that they give an available copy of the original. This offers a field of usefulness in the original message or documents in which the exact form is of significance, such as autographed letters, legal papers or signatures. Messages in foreign languages, employing alphabets and forms not suitable for telegraphic coding, are specially suitable for transmission by the picture service.

"Cartoons may also be successfully sent. To producers of moving pictures it will be effective in sending still pictures of new productions to distant points for advertising display. Involved movements and diagrams of intricate engineering information which would be difficult to describe verbally or by telegraph, can be readily sent by transmission of the original drawing.

"The wire service is now able to transmit designs of the latest dress models. Advertisements may be transmitted by the service. It often happens that large advertisers desire to place illustrated copy with certain typographic design, quickly in different parts of the country. This will now be possible.

"The value of electrically transmitted pictures in connection with police work has been recognized from the earliest days of the experiments.

Color Transmission

"It is also possible to transmit a three-color photograph over telephone lines as three separate black and white records, each corresponding to one primary color. These records, on combination at the receiving end, make up the color picture additively.

"The picture transmitting method of the Bell System," Mr. Mueller concluded," was designed for practical commercial use based on principles reduced to practice in the laboratories of the Bell System for utilization in the building up of the telephone system. It has been called telephotography and the company thinks well enough of its possibilities and usefulness in commercial and professional life to have established three telephotograph offices for transmitting and receiving pictures."

Following the talk by Mr. Mueller, Mr. A. G. Balcolm, assistant superintendent of schools, Newark, N. J., spoke upon the topic of "Why Use More in Teaching Than the Printed and Spoken Word?"

The Origin and Development of Language

We are told in the eleventh chapter of Genesis, verse 1, "And the whole earth was of one language and of one speech," and again in verse IX, "Therefore is the name of it called Babel; because the Lord did there confound the language of all the earth; and from thence did the Lord scatter them abroad upon the face of all the earth." From the foregoing we have reason to assume that early man had one language and that as he migrated to other parts of the world his language changed. Surely this is in keeping with the theory that man originated in, we will say, Central Asia, and as he moved to other sections of the world his nature and language were changed through his adjustment to different physical environments over long periods of time. This will account for the different races of people with different colored skins and corresponding differences in physique and mentality. We have learned that a temperate climate with marked changes in seasons is most conducive to a high standard of civilization. The supreme struggle of all people has been the acquiring of the fundamental needs of life, food, clothing, and shelter. Where the struggle has largely consumed the energy of the people, that race has not risen to a high standard of civilization. Where races have produced these necessities in abundance through the use of inventive implements and facilities and better understanding of nature's laws so that a considerable number of people could devote their attention to the socalled higher pursuits of life, those races have risen in the scale of civilization. The origin and development of language has gone hand in hand with the experiences and development of the race. We can well imagine that the language of early man was closely allied to his struggle for existence. Whatever vocal utterance he may have used we may be sure it was accompanied by many gestures of the body, particularly of the hands. The earliest indications of recording ideas on material things of which we have any record date back to 3000 B. C. These records were wholly symbolic or hieroglyphic. The Egyptians apparently were the first to invent an alphabet which grew out of picture writing such as the Chinese still use.

The Invention of Printing

The invention of printing or the invention of type-mold clearly belongs to Johann Gutenberg, who was born in the great cathedral city of Mainz, Germany, about the year 1400. The first book printed from movable types was made by Gutenberg about the year 1455. This invention had a profound influence upon the language and thought of the world as it proved to be the most effective medium of thought the world had ever known and an incentive to future generations to possess the rudiments of an education. This marked the beginning of printed books on a large scale and since that time their growth has been constant. In this day and generation it is possible for us to learn through the newspaper, magazines and books much of the past. in fact it is through reading that we learn how the men and women of a thousand years ago lived. what they thought, and what they did to retard or advance civilization.

The Written and Spoken Word Has a Physical Background

To fully interpret the written and spoken word one must have some knowledge of the background involved, in other words, one must have an experience kindred to the one contained in the written or spoken sentence. It is said that it isn't so much what we read out of a book as what we read into it that counts. When we read from the printed page or listen to the spoken word we invariably form mental images or visualize the situations set forth according to the extent of our experience in that field of thought. You will note that these expressions which originally were based on a definite physical background but long since have been used in a generic sense will awaken in each one of you possibly a different mental picture. A. He that plants thorns must never expect to gather roses. B. Birds of a feather will flock together. C. There is many a slip 'twixt the cup and the lip. D. Hit the nail on the head. E. Turn over a new leaf.

The Average Intelligence of the Individual Increases with Each Generation

To be well informed in this day and generation involves a greater knowledge than that of any previous generation because there are so many more things that have been revealed to the mind of man. And the end is not yet. Therefore, each generation must be trained and taught just a little bit more than the one immediately preceding, and in order to do this we shall need to employ such methods of presentation and reaction as will give our teaching the stamp of realism.

Change of Population from Rural to Urban a Factor to be Considered in Our Teaching

The fact that our population is becoming more and more urban where the background of a rural atmosphere is wanting is one that has to be reckoned with in our teaching. With the increase of population in urban centers and increase of wealth that permits more and more people to live without contact with the productive occupations there is grave danger that life will become for many people artificial and superficial and that their thinking will become distorted and in some cases depraved. It is under such circumstances that people get the impression that the world owes them a living, hence the great army of the unemployed in every large city of the land. The productive industries are those that contribute to the fundamental human needs—food, clothing and shelter. While "life is more than meat, and the body more than raiment," yet these are the fundamental things of life and for the most part consume the energy of men in their procurement. It is here that pictures and exhibits in addition to the printed and spoken word will serve a great purpose in giving the atmosphere and picturing the processes involved in the production of these fundamental needs. Those of us whose business it is to instruct the children of a large and congested city realize how little they know in the realm of nature for they are frequently confronted in their reading with a background or atmosphere in which they have no point of contact by reason of their limited experience. It is under such circumstances that this background should be brought to the pupils through the best available representation at hand, be it found in the exhibit, stereograph, slide. or film.

Motivating Our Teaching and Creating an Atmosphere for It

Perhaps modern education is suffering more today from a lack of definite objectives than from all other causes. This was stressed at the recent meeting of the Department of Superintendence of the National Education Association held at Cincinnati. We may well ponder over the route we are traveling and wonder whither it will lead. We might profitably put these questions to the pupils in our elementary and secondary schools and I am quite sure we would marvel at the answers:

1. Why were you taught to read and what use will you make of it?
2. Why have you learned to write?
3. What use can you make of your knowledge of arithmetic?
4. Why have you studied United States history?
5. Why do you need to know anything about the past?

Similar questions could be framed to apply to all other subjects of the curriculum and the answers from a considerable number of pupils would reveal that our teaching was sadly lacking in motivation, so far as giving pupils clear concepts regarding objectives of the various subjects of the curriculum. It is quite as important to impart to pupils why they should study history, and what this study will do for them in becoming citizens in a democracy, as to teach the facts of history. Then again, an atmosphere or background needs to be created in connection with the teaching of every subject. For instance, suppose we wanted to teach some of the things in connection with the part that water in river form has played in the destiny of man. These are some of the facts—rivers as a rule are formed by little streams that have their source in the mountains. On their way they sometimes form lakes in the shelter of the hills. They sometimes become restless and overflow their banks, while at other times they cut deep gashes in the rocks and go tumbling down in the form of falls. River beds have become the routes of travel and transportation. Rivers have been dammed up for drinking purposes and for water power and they have proved attractive for human settlement. Man's creative power has been taxed in building bridges over rivers. These are the facts that may be taught through the printed or spoken word.

Mr. Balcolm used a Ford Education Weekly "The Flowing Road" to show how valuable visual illustration is in giving a background to the written and spoken word. This brought out vividly the details of what he had explained in regard to the river from sourch to mouth. Mr. Balcolm told of a boy who after seeing a movie on the mining of anthracite coal said, "Now I can understand why coal costs so much, because coal mining is a hazardous thing."

Mr. Balcolm believes that all manual training shops should use every type of illustrative material possible such as a bulletin board for clippings of industrial interest, pictures of tools, charts on the development of machines, stereopticon pictures, and moving pictures.—Lloyd F. Stair.

THE QUADRANGLE VOCATIONAL CLUB HOLDS MEETING

The Quadrangle Vocational Club of Ann Arbor, Lansing, Jackson, and Adrian, Michigan, held its regular meeting on Saturday, December 12th, at Ann Arbor. Merlynn Smiley acted as chairman of the meeting.

Dr. George Meyers, of the University of Michigan Vocational Department, discussed present tendencies in in-industrial arts work. He held that present tendencies in the industrial arts indicate that in years to come more attention will be given to industrial arts than ever before. It will be taught for purposes of general education and more work will be offered.

Dr. Meyers pointed out that the best thing which has been done in recent months is the introduction of the gen-

eral shop plan. Boys and girls have less opportunity than ever to learn the things now taught in the general shop as they used to learn them outside of school. The intermediate school period, he declared, should be exploratory and prevocational but the vocational trend should be more clearly seen.

Again he urged that boys and girls be given more opportunity to choose occupations and that greater attention be given to fitness for occupations, either professional or industrial, before they enter upon training for them. More attention should be given to the value of after school and Saturday work for students.

Occupational information, he said, is extremely important. Part-time vocational training will be required more and more as valuable training because of actual contact with industry. The part-time school will make more contacts and enjoy greater cooperation with industry. Dr. Meyers described the Benton Harbor plan of vocational education through correspondence and pointed out that it is valuable because it enables the school to offer training in a great many vocations.

At the round-table meetings, Mr. Charles A. Wardner talked on shop and drawing, Mrs. Grace Axtell on part-time and continuation work, and Miss Clara E. Youngs on home economics training.

NOW, ARE THERE ANY QUESTIONS?

Compo Relief Ornament

Q. 584. I desire to add relief decoration to the plain space on polychrome book ends. Can you suggest satisfactory material for moulds and for casts?—H. L. W.

A. Casts for relief decoration of furniture may readily be made of compo, which is of ancient origin and is prepared nowadays with various modifications of its ingredients.

The word compo is an abbreviation of the word composition, and is generally applied to material consisting mainly of glue, whiting, resin, and boiled linseed oil. It is widely used in making ornaments, and is fastened to objects while flexible. After setting, the material becomes hard and durable. Oil is used to make the material elastic, while resin is introduced to harden it, toughen it, and to prevent disintegration. Burgundy pitch is used to equalize shrinkage and to prevent cracking of the thicker parts of the ornament. Glue is the binder which furnishes adhesion between the particles of the mass. Water is used simply for diluting the material, so that it can be readily handled.

Formula of Compo

10 oz. glue ¼ pt. water	Heat and dissolve.
6 oz. resin ¼ pt. boiled linseed oil 1 speck Burgundy pitch	To be heated and melted in an iron kettle over a slow, direct fire.

Whiting to be stirred into the above ingredients.

Method of Preparation

1. Soak common high grade glue, or bookbinders' ground glue in water until soft. When thoroughly soaked, place in a pan or tin can and heat with water.

2. Place the resin, boiled linseed oil, and Burgundy pitch into an iron kettle over a slow fire until melted. (This is the only mixture used in gilding to be boiled over a direct fire.)

3. Pour the resin and oil mixture into the hot glue, stirring until it becomes a batter which is called a compo mixture.

4. Add bolted whiting, by the handful, stirring constantly until the mixture becomes thick enough to pour onto a kneading board on a table.

5. Sift some whiting on the kneading board as is done in kneading dough. Pour the compo mixture on it, adding whiting, and kneading until the mass becomes a stiff dough. (It sometimes becomes necessary to beat the dough with a mallet or potato masher to reduce unsoaked lumps.) The compo is now ready for casting.

If the compo mass seems short, that is, if it is not tough and elastic enough, mix another batter with a greater amount of resin. In this way, by experiments, the secret of the best composition for working the material will be revealed, and the "still small voice" that "it works" will come to the worker. This is the revelationary method, and by it the process becomes the worker's own and the joy of attainment and overcoming amply repays all efforts.

Casting for making ornaments may be made by taking a ¾" board of suitable size and nailing four narrow pieces of ½" stock along the four edges. This forms a shallow box, into which the compo material is poured. The surface of the material is made level with the tops of the sides, and the ornament which has been modeled in advance is pressed into the soft compo material. When this is dried, the surface is oiled with linseed oil and the mould is ready for casting any number of ornaments.

A piece of paper attached to the ornament immediately after it is cast will help to lift the ornament out of the mould and to handle it until it is dry and ready for use. To affix the ornament steam it over hot water, put glue on the back, and press down around the edges and corners of the object.

The ornament may be stained with any wood stain or polychrome, and finished with the balance of the piece.

—C. A. Kunou.

Color and Stipple Effects

Q. 563. Kindly tell me how to produce a clean, contrasting two-color effect on stippled work, such as a black background with high spots gold and a blue ground with high spots silver. What materials are used for these backgrounds?—H. P. G.

A: The clean, contrasting two-color effect on stippled work can be produced in the following manner: Please remember first that your high lights, such as gold on black or silver on blue, must be laid as a ground coat. For the gold and silver, use bronze powders of the correct shade mixed with the banana liquid and let set for at least hours in a warm room, although over night is to be preferred. Secure auto colors ground in Japan for the black and blue, reduced to a very thin consistency with turpentine only, and apply with a very soft brush, as a one or two inch camel hair.

By commencing to wipe the work with cheesecloth immediately after applying the color, or by waiting a definite amount of time before starting work, entirely different results may be secured, according to the cleanliness or completeness of the operation of removing the color glaze on the ground coat. Occasionally, it may be desirable to get a stipple effect by pouncing the work with crumpled itssue paper, cheesecloth, newspaper, or sponge in order to lift off the glazing color in spots and thereby expose a proportionate amount of ground color which then becomes a high light.

Let the materials dry twenty-four hours and in order to protect them; apply a sprayed or brushed coat of cooked laundry starch which will be thin and invisible after application.

If an antique effect is desired dust the entire piece with powdered rotten stone after the starch is dried, wiping off or dusting off all excess powder.—**Ralph G. Waring.**

Toy Boat Fittings

Q. 582. I want help in the latest and best sails and rigging for a two-foot yacht. Also the best connections in a two-foot motor boat for motor and propellor. I am using a bicycle spoke for the propellor shaft, with a nut on the propellor end of the shaft. I am experimenting and want help in installing a motor or a little steam engine in motor boats.—C. E. H.

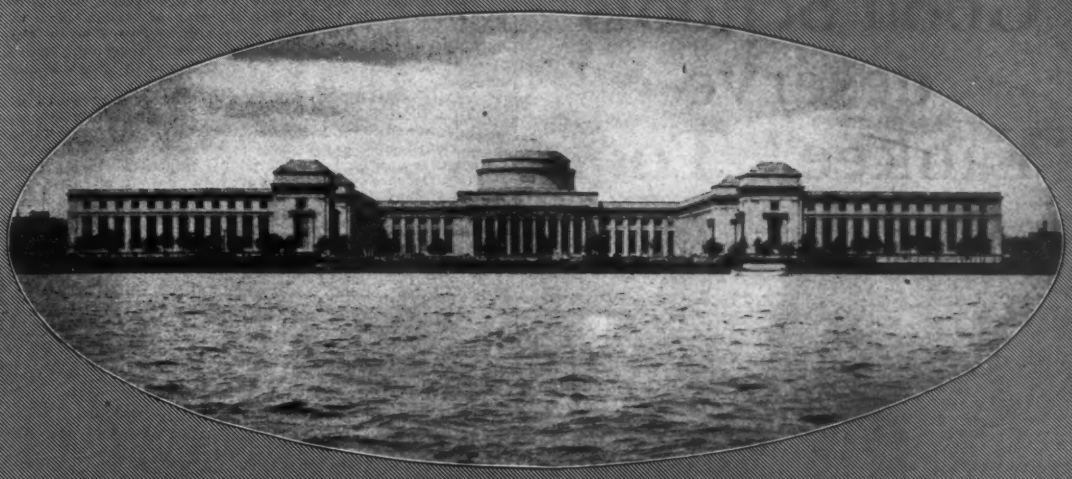
A: We are rigging 24" yachts, both with the marconi rig and lug rig or bow, gaff and mast. The marconi rig of course has no gaff. The mast is placed from 9" to 7" from the bow; if 7", a shorter bow sprit is required. Sometimes we rig them without any bow sprig. These are the knock-a-bouts.

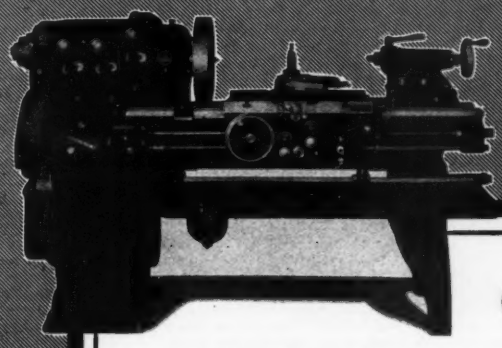
The lugging has a mast 22"-24" long, and a boom 19"-23" long. The sail ought to be about 12" on the mast. The bow sprit is 7"-9" long and the jib runs up on the mast an inch or more above the sail. The mast for a marconi rig is usually 26" long, the boom 20", and the bow sprit 7" or no bow sprit at all.

The placing or locating of the mast will necessarily have to be tried out to suit the particular model.

We have not found it practical to build the 24" motor boats, because of the difficulty of finding room for the motor and batteries, and at the same time keeping the boat high enough above or out of the water to make any speed. A fast boat goes over the water and not through it.

We are using ⅛" brass rods for propellor shafts. We bore a hole in the propellor, insert the shaft and solder it, making a permanent job. Then we take a ¼" brass tubing (special, very light) of the desired length and solder each end up; then bore a hole through the solder to fit the shaft, thus making a bearing on each end. We fix the shaft to the motor by drilling a small hole in the shaft and also in the motor shaft, and connect them with a small spring, forming a differential joint.—**John W. Cavileer.**





and now—

The Massachusetts Institute of Technology uses The

MONARCH Helical Geared Ball Bearing LATHE

as a part of their Metal Working Equipment.

The prestige of this Institute—the corner-stone of Massachusetts' enviable system of vocational education — attracts students from the four corners of the civilized world.

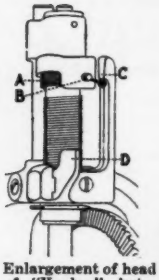
In choosing the equipment for these students, the directors of the Institute must base their choice upon equipment that will give students the greatest possible amount of experience.

We are proud of the selection of the MONARCH Engine Lathe as a part of the Institution's metal working equipment — proud that it has been selected solely upon its merit, after careful consideration, as the type of equipment necessary for the high degree of training which Massachusetts "Tech" gives to its students—a training which has been so creditably reflected on the Institution by its graduates.

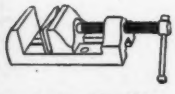
We shall be glad to plan your vocational metal working shop. Give us a statement of your requirements and let our Free Engineering Advisory Service plan your shop, giving you an accurate estimate of the entire equipment cost. This service is gladly rendered without charge.

THE MONARCH MACHINE TOOL COMPANY, 404 OAK STREET, SIDNEY, OHIO.

Good Schools deserve "Yankee" Tools



Enlargement of head of "Yankee" Automatic Bench Drill. A — Ratchet Teeth. B — Ratchet Shifter in "knock-off" position at extreme of up movement. C & D—Automatic "knock-offs" at top and bottom.



"Yankee" Vise No. 990 Designed for use on Bench Drills. Machined true on ends, bottom and sides. Swivel jaw for taper work. Jaws open 3 in.

Saves Money by Saving Drills

This tool saves drills in shops where the workmen are expert mechanics. Certainly, it will save a far greater proportion of the drills in schools with inexperienced students.

The Automatic Ratchet Feed takes the place of hand feeding. It adjusts the pressure perfectly for all drills from the smallest up. This saves drills—and, therefore, money.

Just turn crank. Friction Feed runs drill down to work. Then Ratchet Feed operates.

"YANKEE" Automatic Feed Bench Drill

Accident-proof! Automatically knocks off Ratchet Feed at end of upward and downward movement, preventing jamming, stripping, or broken gear teeth.

No. 1005 (illustrated). Two speeds; 3 jaw chuck holds drills up to ½ in. Entire length 28 in.

No. 1003. Single speed; 3 jaw chuck holds drills up to ¼ in. Entire length, 18¾ in.

Some other "Yankee" Tools

Ratchet Hand Drills	Ratchet Screw Drivers
Ratchet Breast Drills	Ratchet Tap Wrenches
Ratchet Bit Braces	Automatic Push Drills

Dealers Everywhere Sell "Yankee" Tools

"Yankee" on the tool you buy means the utmost in quality, efficiency and durability

Every school should have the "Yankee" Tool Book It tells all about the famous "Yankee" Tools. Write for your copy today.

NORTH BROTHERS MFG. CO., Philadelphia, U. S. A.

"YANKEE" TOOLS
Make Better Mechanics

CHICAGO INDUSTRIAL ARTS ROUND TABLE

The Industrial Arts Round Table of Chicago met on January 15th to discuss the topic "The Relation of Manual Arts to Vocations". Mr. J. O. Steendahl, of the Benjamin Electric Company Chicago, made a talk preceding the discussion. Mr. Hanna, director of personnel of the Joliet Township High School, presided.

Mr. Steendahl first pointed out that work is worth while on other than trade grounds. Drawing for instance is the language of the mechanics and reveals a tie to many jobs. Fitness for promotion or transfer is based on more than technical grounds. Here are ten ratings considered by management: (1) Production ability; (2) money making power—a man is an asset or a liability; (3) the quality of his work; (4) his interest in his job; (5) intelligent initiative (65% of the time spent in many plants and planning departments is instructing, as new ideas filter down through the organization. From these contacts come suggestion systems); (6) reliability; (7) cooperation; (8) deportment; (9) appearance as to neatness, tidiness, etc.; (10) regularity of attendance.

Is it worth while for a boy to repeat a job? Yes. Because business is always repeating. One of the best places where repeating is of value is the field of art in industry. Sales values of everything depend more and more on appearance. Our present-day business men got their training by the steady improvement of their product and schools then as now have little to offer in this field. Where training means progress, the instruction reflects trade tendencies, but pedagogical phases of work in public schools have to be satisfied.

Mr. C. A. Gilkerson, of the Public Service Corporation of Northern Illinois, said that training within industries always had been and would be necessary. The trainers are often foremen, who were picked because they are good workmen. Frequently, too, as the need of instruction on large units of new practice is recognized, new employees join with the older in maintaining a morale of service. This is where schools can cooperate with industry by developing an open mind toward new things.

Mr. James McKinney, of the American School, Chicago, pointed out the predominance of personal qualifications in Mr. Steendahl's list. Manual arts people had better study consumer's appreciation and adopt a structural and an art point of view. A social appreciation, too, of what the other fellow's job means ought to be in the ken of the teacher. What are our boys thinking about anyway? What are their attitudes toward the teacher? They must be favorable first. Then the attitude toward the job in demonstration and the assignment for tomorrow will bring the spirit which makes the man.

Mr. A. B. Carlburg, of Gary, reported on the work there. He said that we often had hazy ideas of an occupation or trade, and men from these trades could help direct the ideas of working people toward work with less change later.

Mr. Fultz, of the Sterling Morton High School at Cicero, declared that in spite of the one man system frequently found in schools where manual arts was on trial, the work had value for boys as a "try-out". He further thought that if men and supervisors were alert, that quite a bit could be done as work developed toward satisfying a part of trade apprenticeship. Mr. Fritsch, of Gary, would rank manual arts according to the maturity of the boy. It extends the range of experience and may be classified as pre vocational, vocational, technical, and graduate.

Mr. Leonard Wahlstrom views the work shop as fully as important as the classroom. He quoted recently published figures, that while we are only six per cent of the world's population, we produce sixty per cent of the manufactured goods. Other men pointed out that there must be improved matching of ability with work for which the boy wants credit, and that the lad under economic pressure was entitled to his chance just the same. What can we do for our American youth? We can make the lad see a vision which may wind up in an architect's office, or we can make a branch of trade work so vital that the boy will go on into the business he has mastered on its technical side. We have no monopoly on opportunity, just a wonderful chance to hit where it is worth most.

Mr. Willis, of the Pullman Free School of Manual Training, observed a tendency to get away from a phase of work with which the teacher must think clearly. What does your public expect? What do they get? Answer—Educate them.—**Robert B. Bagby.**

PRINTING TEACHERS WILL HOLD GROUP MEETING IN SYRACUSE AT THE TIME OF THE EASTERN ARTS CONVENTION

A group meeting has been arranged to be held in Syracuse, on Saturday afternoon, April 24, 1926, the end of the week of the regular convention of the Eastern Arts Association.

The prominence of the speakers who have promised to come, and of those who have been asked to be on the program, should draw a record number of printing teachers and others interested in the teaching of printing.

Mr. R. A. Loomis, Jersey City, will preside.

Mr. James M. Lynch, president of the International Typographical Union, has been secured for an address. He will probably discuss printing teaching from the viewpoint of the trade.

Mr. H. E. Milliken, head printing teacher of the Worcester Boys' Trade School, Worcester, Mass., will tell of printing instruction as he has learned to know it after years of successful teaching.

Mr. Frederick A. Coates, assistant agent, Industrial Training Department of Education, Boston, has been asked to address the specialists in printing. Other speakers will be secured. After the addresses the meeting will be thrown open for general discussion to those present.

A New Circular Saw That Rips Or Cross-Cuts Equally Well.

The Planer Saw Most Convenient For School Shops

This is the new Simonds circular saw that is proving so satisfactory in school shops. For fast hand feed cutting it gives results practically as smooth as a planer knife. It cross-cuts or rips and works equally as well on hard or soft woods. Can be used for mitre work or jointing. Looks like the old time novelty saw but it's different. Made 6 to 24 inches in diameter.

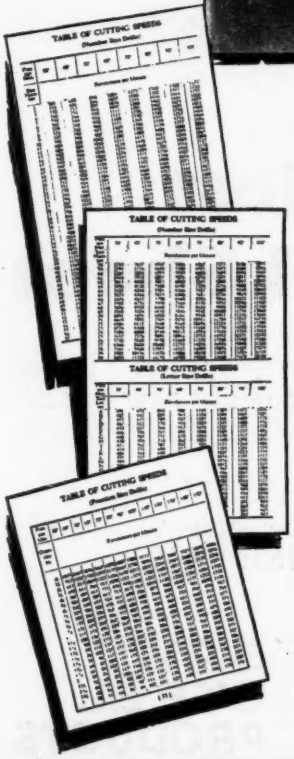
When ordering be sure to specify SIMONDS PLANER SAW.

SIMONDS SAW STEEL PRODUCTS

ESTABLISHED 1832 — FITCHBURG, MASS.

CHICAGO, ILL. BOSTON, MASS. DETROIT, MICH.
NEW YORK CITY NEW ORLEANS, LA. LOCKPORT, N. Y.
MEMPHIS, TENN. LONDON, ENGLAND PORTLAND, ORE.
SAN FRANCISCO, CAL. SEATTLE, WASH. MONTREAL, QUE.
TORONTO, ONT. VANCOUVER, B. C. ST. JOHN, N. B.

Do you know the right drilling speeds?



AT what speed and feed should a 7/16-inch carbon steel drill be started? A ¾-inch high speed steel drill? What is the difference in the starting speeds when drilling in machinery steel, brass and cast iron? How many revolutions per minute does a 5/16-inch drill make operating at a speed of 50 feet per minute?

All of these questions are answered for you on pages 32 to 35 of the Handbook for Drillers, which Vocational School Directors and Instructors tell us is the most authoritative textbook on twist drills and drilling practices published.

As our contribution to vocational education, we want to send copies of this Handbook, in any reasonable quantities, to Directors and Instructors for use in their machine shop classes.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND NEW YORK·CHICAGO·LONDON

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

NEWS AND NOTES

New Los Angeles Trade School. Plans have recently been completed at Los Angeles, California, for the erection of a new home for the vocational classes in the field of trades and industries developed in connection with the trade-extension high school and the Grand Avenue trade school. The two groups of classes have been consolidated and the new school is known as the Frank Wiggins Trade School.

The trade school is located on a site in the business district and is valued at more than a quarter of a million dollars. It is to be a Class A reinforced concrete structure, eleven stories high, and embodying the latest innovations in trade-school design and equipment. The plans call for three units. The center unit will be built to its full height, with side units of three stories. The remainder of the building will be completed as the size of the city and its demand for industrial workers grow.

In addition to administrative offices, assembly rooms, and reading rooms, provision has been made for such trades as dressmaking, costume design, telegraphy, power sewing, plastering, tile setting, painting and decorating, linotyping and printing, millinery, bricklaying, sign painting, show card writing, auto mechanics, welding, sheet metal work, pattern making, machine shop practice, cafeteria and tea room cooking, architectural drawing, structural drafting, jewelry and watch making, cabinet-making, and nursing.

The first unit of the school, which is to be built immediately, will accommodate about 5 000 students.

The school will become an integral part of the Los Angeles school system and will work in cooperation with the regular high schools. An agreement has been made whereby students may attend the trade school one-half day and the regular high school one-half day. This gives them three hours each day of intensified preparation for entrance to a skilled occupation, while they are completing a high school course.

Cooperative agreements have also been completed with the industries of the city and apprentices will spend from four to sixteen hours a week in the manipulative and supplemental processes of the trade which they are learning. The school runs continually from eight in the morning until ten at night and offers a number of short-unit courses to those desiring self-improvement in special branches of their occupation.

COOPERATIVE TRAINING IN THE ELECTRICAL INDUSTRY

With less than a year of work to its credit, the high school vocational department at Sacramento, California, succeeded in making arrangements for training on the job for students in the electrical division last summer.

An advisory committee from the electrical craft had been formed during the year. It was composed of one representative each from the electrical workers' union, the contractors' association, and the public schools. Visits were made to the school by representatives of industry, and they prevailed upon others to call and inspect the work of the electrical department.

Actual trade conditions could not be duplicated in the school, but the department aimed to make the work as practical as possible, and a request was made that the school be permitted to select a few students for the summer vacation to work with the journeymen of the city. The scheme was approved by the members of the committee and in turn by their respective organizations. The conditions of employment agreed upon were as follows:

All boys were to start at an initial wage of $1 per diem, and to advance as rapidly as each demonstrated his ability to earn more. The business agent was to give the boys his personal attention and care. Each boy was to be placed with the employer doing the type of work most nearly suited to the boy's ambition.

The results of the experiment were illuminating. Only one boy of the seven failed in meeting the agreement. He lasted one day and quit. The other six stayed on the job all summer. As a result of the experiment, not only the boys but the advisory committee and the electrical division learned something of value and the experiment will be continued another year.

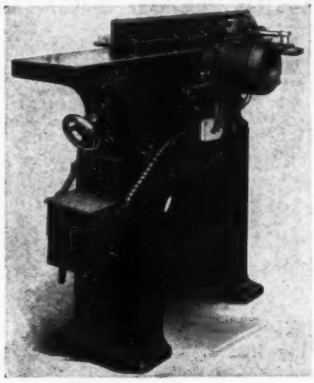
Continuation Schools Have Rapid Growth. A report recently submitted to the New York City board of education by Supt. W. J. O'Shea shows that nearly 10,000 more young workers are enrolled in the compulsory continuation schools than there were a year ago. The total register of these schools in November last was 50,289, an increase of 9,723 pupils during the twelve-month period. The November register was a decrease of 446 pupils from October, 1925.

The average daily register during November was 10,087, a gain of 2,047 over November, 1924, and a decrease of 159 from October, 1925. The average daily attendance in November was 8,508 as compared with 5,419 a year ago.

State Teachers Hold Meeting. The Arkansas Educational Association held its annual convention November 12th and 13th, at Hot Springs. Mr. R. T. Randol, of Fort Smith, who was present at the meeting, talked on "Industrial Contacts in the Community." He talked on the fundamental purpose of education, pointing to the need of night schools for the army of industrial workers, the establishing of night school contacts, advertising the school to the students, the employers, and the public, the attitude and preparation of the teachers, the character and arrangement of the courses, and ways of reaching the community through the night school department. At the close of the meeting, Mr. Randol was elected president, and Mr. Seibloert, of Little Rock, secretary, for the current year.

The New York City board of education proposes to establish a school in which all the needle trades are to be centralized.

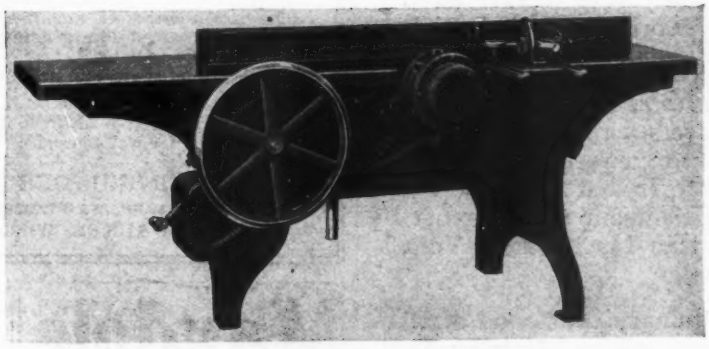
(Continued on Page 27a)



American No. 1 Bench Jointer

Knowledge Gained on American Machines will never Desert You

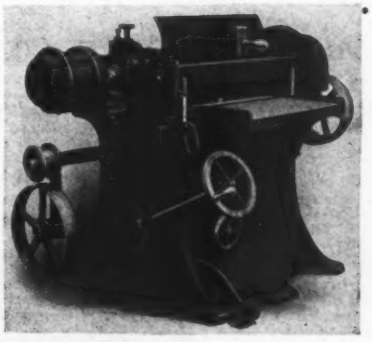
Training in Shop Practice should always be done on real shop machine.



American No. 1 Buzz Planer and Jointer

American Machines spring from the highest requirements of the industries. They are industrial machines.

"The tools of school are the tools of life"

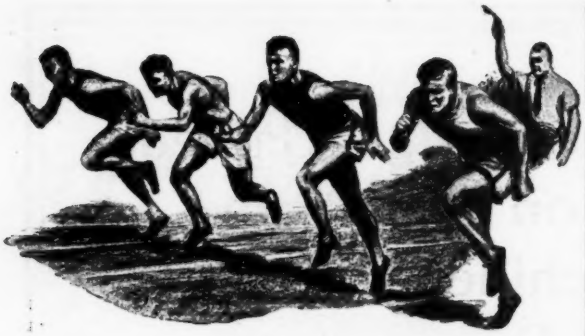


American No. 1½ Single Surfacer

Yates-American Machine Co.

Educational Department

ROCHESTER, N. Y.



A Good Start

Is half the race. An apprentice who starts with cheap, inaccurate tools unconsciously — but inevitably — tends toward cheap, inaccurate work. Even the experienced workman finds it difficult to do *good* work with inferior tools.

If you're buying tools for others, be fair to them—if you're buying tools for your own use, be fair to yourself. Buy Starrett Tools—the tools that have won the confidence and friendship of two generations of American Machinists. Your dealer sells them.

Also, as a preliminary to a good start, write us for a free copy of Catalog describing the whole Starrett line of more than 2000 fine tools. Ask for No. 23 "CE."

THE L. S. STARRETT CO.

World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes - Standard for Accuracy

ATHOL, MASS.

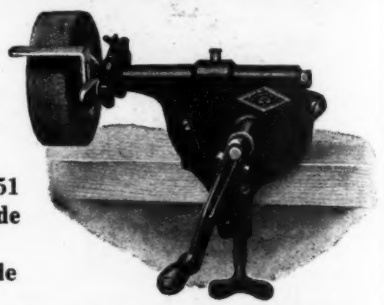
Set No. 901 consists of: No. 11—6 inch combination Square complete with Sliding Head and Center Head, No. 117 B, Center Punch, No. 320, 6 inch Flexible Steel Rule in Pocket Case, No. 390, Center Gauge, No. 79, 6 inch Outside Caliper with Solid Nut, No. 73, 6 inch Inside Caliper with Solid Nut, No. 77, 5 inch Divider with Spring Nut and The Starrett Book for Machinists' Apprentices, Vol. I.

Starrett Tools

8905

Sharpen Edge Tools
on a LUTHER TOOL GRINDER

Ask for catalog and prices.



The No. 51 Best Maide is the Best Made

Manual training instructors, skilled mechanics, carpenters and pattern makers have found that Luther Grinders are the safest and most practical tool grinders made—excellent design and workmanship—a real quality product.

Grinder illustrated is our No. 51 Best Maide, ball bearing, swivel type hand grinder, equipped with combination (medium and fine) grinding wheel, especially adapted for grinding edge tools. No. 51 is equipped with 5x1½x⅝" DIMO GRIT grinding wheel and plain tool rest.

A special chisel and plane bit holding attachment can be furnished — insures uniform, accurate hollow ground bevel always.

LUTHER GRINDER MFG. CO.,
285 SO. WATER STREET,
MILWAUKEE, WISCONSIN.

Maydole
Hammers
Cost less in the end

Let the budding carpenter or machinist use a Maydole hammer. It will be an inspiring object lesson of the value of fine tools.

Maydole Hammers far outlast ordinary hammers. They have the strength to stand the severest use or abuse. You'll find them actually the cheaper in the long run. Inquire of your dealer, or write us for Catalog 23 "H."

THE DAVID MAYDOLE HAMMER CO.
Norwich New York

Maydole Hammers — YOUR HAMMER SINCE 1843

8842

Boring Tools — 97 TYPES AND SIZES

Breast Drills—Hand Drills—Bit Braces

WE now make ninety-seven types and sizes—special types for different kinds of work—each offering the highest quality possible at the price. The full line is shown in Catalogue No. 34.

Make especial note of their sturdy construction. Each Boring Tool has Stanley quality, workmanship and finish throughout.

Ask for Catalogue No. 34—a valuable reference book of 179 pages. A copy will be mailed to you on request.

THE STANLEY RULE AND LEVEL PLANT

The Stanley Works, New Britain, Conn.

New York Chicago San Francisco Los Angeles Seattle

STANLEY S.W.

STANLEY TOOLS

(Continued from Page 24a)

Silk Designs by American Artists. Designs of printed silks by a group of six contemporary American artists, were exhibited at the New York Art Center, in November, the idea being to create for our own day distinctively American designs. In all, 31 fabrics were shown.

Girls' Vocational School. The newest home economics project in Baltimore is the girls' vocational school, which went into operation last fall with a class of 25 girls, who are learning the dressmaking trade. Other vocations such as millinery and novelty work will be added.

A two-year course in institutional cookery was organized last fall at Baltimore, with the opening of the Frederick Douglass high school for colored students. It is planned to meet the needs of boys and girls who desire to prepare for employment in the management, preparation, and service of foods in ships, hotels, restaurants, cafeterias, dining cars, and clubs. Twenty boys and girls have enrolled for the course.

Vocational Budget Approved. A budget of $528,700 has been adopted by the Essex County board of vocational education at Newark, N. J. An amount of $434,700 is to be raised by the county for vocational purposes.

New Vocational Classes Formed. At Fort Wayne, Ind., vocational classes have been organized in machine shop practice, millinery, and the use of the dictaphone. Other classes are automobile mechanics, typewriting, comptometer, shorthand, printing, mechanical drawing, blue print reading, and dressmaking.

New Vocational Building. The high school at Elloree, S. C., has put into use its new vocational building, in which agriculture, home economics and similar subjects are taught. The building was erected at a cost of $5,000.

Trade Courses Open to Students. Boys and girls in Brooklyn Borough, New York City, who because of congested conditions in the technical and trade schools, cannot be admitted to those schools, are now offered an opportunity by Public School 64, Brooklyn, to continue their education along technical or vocational lines.

One Thousand Students in Evening Industrial School. More than one thousand students recently completed the first semester of the industrial evening school at the Hawthorne Works of the Western Electric Company, Chicago, Ill. The second half of the school year opened on January 11th with an even larger attendance.

Conducted entirely for employees of the local plant by the Hawthorne Club, the school includes in its curriculum every subject that is of interest to men and women workers at the plant. Sixteen subjects, covering various phases of telephone engineering and manufacturing, as well as office training, make up the year's educational program. More than fifty instructors, picked from among the employees for their knowledge of the various subjects and for their ability to instruct pupils, minister to the needs of those who enroll in the evening courses.

Jewelry Making Course. A course in jewelry making has been added to the work in the applied arts department of the high school, Wheeling, W. Va.

Vocational Education in Georgia. The General Assembly of Georgia, at its last session, increased the appropriation for vocational education from $39,000 to $60,000 annually. The increase of $21,000, which will be available for 1926 and 1927, enables the vocational board to cooperate with about fifty additional schools and communities in paying the salaries of teachers of agriculture, home economics, and trade and industrial subjects.

At the last meeting of the state board of vocational education, a budget was approved which provided for using at least fifty per cent of the increase for high schools paying the salaries of home economics teachers. A plan was submitted and approved for paying each school from $250 to $500, depending upon the qualifications of the teacher employed.

Open General Shop. The school district of Forty Fort, Pa., has opened a well equipped general shop and is offering woodworking, printing, automobile, and mechanical drawing instruction. Mr. John Vavalo, of Erie, Pa., has been employed as instructor in this shop.

Vocational Course for Apprentices. The vocational courses at Chester, Pa., have been increased by the addition of a course for apprentices in the foundry trades. The classes are conducted on Saturday mornings and boys from 16 to 21 years employed as apprentices in the foundry attend the classes on their employers' time. The classes are supervised by Mr. Frank Coulter, director of vocational education, Chester, Pa.

New Foundry Courses Offered. Foundry courses for apprentices are being offered under the cooperative plan at Waynesboro, Pa., in addition to those given for machinists and patternmakers. The course was started in September and much interest was shown by the boys enrolled.

General Shop Instruction. Mr. Lewis Lerda is the instructor in the general shop at the Church Street School, Coatesville, Pa. Instruction is being offered in printing, sheet metal work, automobile mechanics, woodworking, foundry work, electricity, painting, carpentry, mechanical drawing, and metal-working.

Three Industrial Art Centers Opened. Three industrial art centers were opened in the east, west, and George Ross junior high schools, Lancaster, Pa. Vocational evening classes in plumbing, electricity, and mechanical drawing are now being conducted. Mr. W. H. Brunton, formerly of Chester, Pa., is director of industrial education.

BISON BRAND GLUE

100% Adhesiveness

A superior adhesive manufactured by the same process as Pure Food Gelatine, under ideal climatic conditions. This process, and the careful selection of raw material, yields a glue of 100% adhesive matter.

The most vital consideration in buying glue is its keeping properties. The BISON BRAND being 100% pure, its keeping properties are guaranteed.

The unusual adhesive strength and penetrating qualities make it an ideal glue for all requirements of the woodworking industry and school shops.

Uniformity is guaranteed.

Liberal working sample submitted upon request, in Sheet, Flake or Ground form.

HENRY WILHELM COMPANY, INC.

134-136 Tenth Street PITTSBURGH, PA.

Junior High School Shop. A junior high school at St. Mary's, Pa., has been equipped with a general shop.

General Shop with Three Activities. A general shop with three activities, including woodworking, electricity, and sheet metal, and another for drafting, are included in the new junior high school at Indiana, Pa.

General Shop Plan at Beaver Falls, Pa. The general shop plan is in operation at Beaver Falls and is fully equipped to offer sheet metal work, woodworking and electrical work.

Related Instruction in Williamsport. Four teachers have been secured for related instruction in Williamsport, Pa. Mr. John Davis is in charge of the science instruction, Mr. A. K. Patterson of the mathematics, and Mr. Stewart Walter, in charge of the English work. Mr. S. V. English is instructor in drafting.

About sixty boys are working under the cooperative industrial plan at Williamsport and the employers are willing to take on additional boys. In some of the industries, practically all the apprentices are cooperative students. Among the new evening vocational classes organized are a special class for employees of the Lycoming Rubber Company and advanced classes in automotive ignition and fixture design.

Second Annual Conference for Plumbing Instructors. The annual conference for the training of plumbing instructors in Pennsylvania will be held February 22nd to March 6th, at Pittsburgh, Pa., in cooperation with the University of Pittsburgh, the Carnegie Institute of Technology, and the National Trade Extension Bureau of the Plumbing and Heating Industries. The instruction is suited to any worker with five or more years of experience as a journeyman plumber. No training is offered in the practical work of plumbing, except as incidental to the illustration of teaching methods.

Under the plan, each local chooses as instructors two or more men who, besides being masters of the plumbing trade, have at least a grammar school education, are of suitable age, and have a personality that enables them to handle young men under instruction. These men attend the conference with the understanding that they are to become apprentice instructors after receiving the training. Tuition in the conference is free, but a registration fee of $4 is exacted to cover all charges, including registration for credit in the University, and the fee for the certificate of attainment issued to those who satisfactorily complete the course. The cost of the instruction is borne by the National Trade Extension Bureau and by the state and federal governments under the provisions of the Smith-Hughes act.

Seventeenth Annual Convention. The Eastern Arts Association will hold its seventeenth annual convention April 21-24, at Syracuse, N. Y. The association held a poster contest to obtain a suitable convention poster advertising the meeting.

Pennsylvania Vocational Society Meets. The Pennsylvania Society for Vocational Education held its annual banquet at the Hotel Casey, Scranton, Pa., on December 30th. President James Killius presided. Dr. C. A. Prosser, who gave the main address of the occasion, very ably discussed the topic, "Part-Time Education in Theory and Practice," and Mr. L. H. Dennis discussed the American Vocational Association. The following officers were elected for the ensuing year:

President, C. F. Bauder, Philadelphia, Pa.; Secretary-treasurer, C. E. Hedden, Harrisburg, Pa.; Vice-presidents, J. S. Champion, Williamsport, Pa., agriculture, Mrs. Edith D. Davison, Pittsburgh, Pa., home economics, James · Killius, Johnstown, Pa., continuation schools.

Poster Competition. The American Humane Association, Albany, N .Y., has announced its forthcoming eighth annual poster competition. The subject deals with kindness to children and animals. The Association offers $450 in prizes, divided among four groups, and offers to send copies of posters of previous winners to teachers who desire them. The closing date of the competition is June first.

Issue Christmas Edition. The Bloom School, Cincinnati, O., recently issued its December number of the regular school journal. This publication is printed monthly and is edited by the pupils of the Lafayette Bloom Junior High School. The editing and typography are excellent as coming from a junior high school. The cover contains a Christmas candle carried out in four colors—a fine example of linoleum block-printing.

The Dalles Printing Course. The printshop of The Dalles high school at The Dalles, Ore., has been placed on a more advanced basis this year. The course covers three years and no students are admitted except sophomores, and these are required to complete the full three years of training. The work is closely correlated with other related departments, and the high school itself offers ample opportunity for practice in the large amount of printing required to be done.

Home Economics Enrolls Large Classes. The home economics department of Williamsport, Pa., has 1,057 girls enrolled in its classes this year. Of this number, 180 are pursuing the four-year vocational course offered in the senior high school. Each class is represented on the staff of one of the local newspapers whose duty it is to keep the editor informed of the doings of the several classes. The reports are published weekly and are intended to keep the department and its work before the public.

General Industrial Course. Corry, Pa., has developed a general industrial course which is planned to lead to a part-time cooperative program next year.

Building Trades Apprentices Graduate. On the Wednesday evening prior to the National Society for Vocational Education

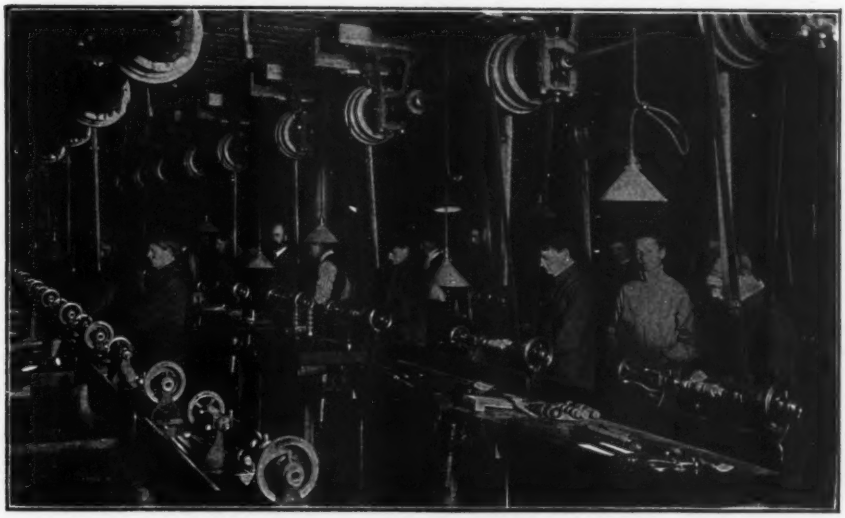
(Concluded on Page 30a)

THE JOHNSON FRICTION CLUTCH

In Service Fifteen Years in

The Stuyvesant High School, New York

150 Clutches Used in the Manual Training Department, in the New Building



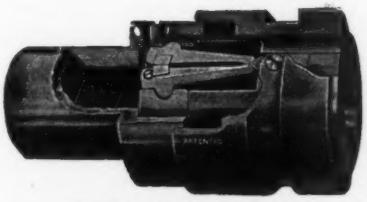
Courtesy: The Stuyvesant High School, New York, N. Y.
(View of original installation in old building of 30 Clutches.)

A record like this ought to convince even the most skeptical that the Johnson Friction Clutch is a money saver and not an expense.

Equip your shafting with Johnson Clutches and forget your troubles.

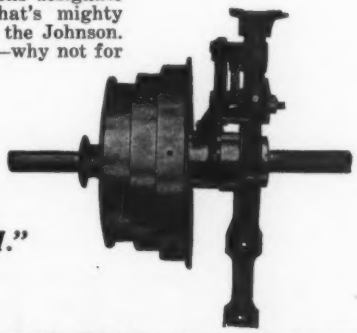
Any size of steel split, solid iron or cone pulleys may be mounted on the Clutch hub.

The school authorities of the great rich city of New York in their official specifications designate Johnson Clutches BY NAME. That's mighty strong OFFICIAL endorsement for the Johnson. Good for Greater New York schools—why not for yours?



SINGLE CLUTCH SECTIONED.
Single Clutches for line shaft drives where high speed is desired.

Write for Catalog "I.A.M."



SINGLE CLUTCH WITH CONE PULLEY MOUNTED AND STYLE "A" SHIFTER BRAKE MECHANISM.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

They Deserve Your Recommendation

"There are no finer school drawing instruments made than Weber-Cosmos." How many times instructors have enthusiastically expressed themselves in this manner.

The skilled workmanship, fine materials and simplified design of Weber-Cosmos Round System Drawing Instruments arouse your instant admiration. Chaste roundness and the absence of set screws make them a pleasure to use. While improved head construction gives super-smoothness in adjustment and encourages the best results from your students—Weber Cosmos are instruments, that deserve your recommendation.

Write for catalog. Address Dept. I-A.

F. WEBER CO.,

1220 Buttonwood St., PHILADELPHIA

BRANCHES:

227 Park Ave. BALTIMORE | 125 So. 12th St. PHILADELPHIA | 705 Pine St. ST. LOUIS

WEBER

Drawing Instruments & Materials

(Concluded from Page 28a)

meeting, Cleveland conducted graduation exercises for the building trades apprentices at the East Technical High School. The class was composed of 23 bricklayers, 27 plumbers, ten carpenters, 21 electricians, ten painter apprentices, making a total of 97 young men ranging in age from 19 to 28 years. All of the men had been employed in the trades during the time of their apprenticeship.

Open New School Shop. The new high school at Forty Fort, Pa., contains new equipment for teaching five different lines of work in the general shop. The shop is one of the best equipped general shops in the state and is in charge of Mr. John Vavalo.

Three Shop Activities. A general shop with three activities, woodwork, electricity, and sheet metal, and another room for drafting are included in the junior high school at Indiana, Pa.

Cooperative Industrial Courses. Cooperative industrial courses at Johnstown, Pa., have taken on a new lease of life with voluntary cooperation from the employers. Evening trade classes in carpentry, blue print reading, show-card lettering and plumbing have attracted large enrollments so that the classes have been divided into two sections.

First Unit Trade Course Increases in Scope. The first unit trade course was started at Braddock, Pa., as part of the high school work. A large portion of the equipment was built by the trade students and old storage rooms were remodeled including the electrical and plumbing changes. All of the work was done by the trade classes. The work has grown to such an extent that there are now 90 students taking industrial courses with a faculty of five instructors.

Vocational Survey. The home economics department at Allentown, Pa., has participated in a vocational survey conducted by the superintendent of schools and the board of education, with the cooperation of the state department. An analysis of the occupations of the fathers was made and visits made to the 300 homes in proportion to the occupations found. A second phase of the survey included a questionnaire to discover the use which present students and graduates of the department are making of the course as offered in the past.

Vocational Guidance Association to Hold Meeting. The annual conference of the National Vocational Guidance Association will be held February 18th, 19th, and 20th, at the Hotel Martha Washington, Washington, D. C. Among the subjects to be taken up at the conference are counselling, placement, personnel service in schools, mental measurements, and occupational information. Joint sessions will be held with the National Committees of Bureaus of Occupation and the National Association of Secondary School Principals.

The Association is a nation-wide federation of persons interested in promoting vocational and educational guidance of boys and girls. Miss Dorothea de Schweinitz, University of Chicago, is president, and Miss Anne S. Davis, Chicago, is secretary.

At this year's meeting, plans will be discussed for a yearbook of the association, in which will be embodied the fruit of the extended experience of active workers in the field of vocational guidance all over the country.

Museum Holds Exhibit of European Industrial Arts. A representative collection of objects from the International Exposition of Modern Decorative and Industrial Art, held in Paris last summer, will be exhibited at the Metropolitan Museum of Art, New York City, from February 22nd through March 21st. The exhibit will comprise furniture, ceramics, glass and pate de verre, silver, inlaid metalwork, ironwork, rugs, woven pattern silks, printed cretonnes, wall papers, and examples of printing and bookbinding.

New Safety Calendar for 1926. The Carnegie Steel Co., of Pittsburgh, Pa., in accordance with its custom of former years, has issued its safety calendar for the year 1926. The Carnegie Steel Company originated the idea of putting industrial safety on a competitive basis, and each year puts into competition among its manufacturing plants a safety trophy, that is held from month to month during the year by the plant making the greatest reduction in lost time accidents for the preceding month, and at the end of the year is awarded to the plant making the best record for the year.

The calendar is the third to be presented by the Carnegie Company and it accurately illustrates the thought and execution of ideas of boys and girls in public and parochial schools between the ages of 11 and 18 years. The present calendar was selected from more than 9,000 posters, and the illustrations are exact reproductions of the drawings presented by the children.

Course in Automobile Mechanics. A course in automobile mechanics, including related shopwork and drawing, has been made a part of the program of studies in the high schools for boys, Philadelphia, Pa., beginning with February, 1926. For the present term, the work is to be limited to the Central High School.

Girls Make Reference Books. Girls in the homemaking class of the Oakland (California) part-time school are making reference books for themselves for present and future needs. Recipes, ways of entertaining, notes on table manners, and the courtesies of introductions, home decoration, and house management are among the favorite topics. Pictures and articles clipped from papers and magazines, carefully copied recipes, and suggestions of interest are gathered by the girls each week and added to their collections.

Another project of the class is the making of a first-aid cabinet—a large and complete one for the school and a small one for the girl herself for use when she is going on a vacation in the mountains or on outing trips.

Would You Like To Save Twenty Years?

EXCERPTS FROM "AN ART OUTLINE FOR GRADE TEACHERS"
PAGE 22
GRADE 7, 1ST SEMESTER

Paragraph 5. Make a good health poster in which a simple figure is part of the illustration. Cut paper, Crayonex, or opaque water colors may be used. Do not attempt too complex an idea.

Paragraph 7. Combine some animal in a panel with a tree or plant design, etc.

Paragraph 9. The last two problems should be devoted to crafts work. Kites, cardboard toys, games, holiday boxes, and calendar pads are good paper projects, etc.

You may or may not care to teach Industrial Art or Handicraft work twenty years longer.

But if you do, will you not have learned by that time a great deal more about your subject than now? Experience is the best teacher, of course; no amount of theory can entirely replace it.

Next to your own experience as an aid, comes the experienced advice of someone else; such advice as you obtain by reading the articles in Industrial Arts, School Arts, and Everyday Art, for example. Thereby you learn how others solved problems which are much like yours.

Similarly, you should call upon the seasoned experience of Mr. Pedro J. Lemos and Mr. John T. Lemos. These gentlemen have also "been through the mill." Years of experience have taught them the short cuts you too could use to such precious advantage. They want to send you a booklet entitled "An Art Outline for Grade Teachers." You really can't afford to neglect their offer. It will cost you absolutely nothing; and may save you twenty years by offering unexpected avenues to new art learning.

WRITE TO

THE · AMERICAN · ART · AID

STANFORD UNIVERSITY · CALIFORNIA

FOUNDED BY

THE AMERICAN CRAYON COMPANY

—a "K & E" Quality Combination for *real* Economy

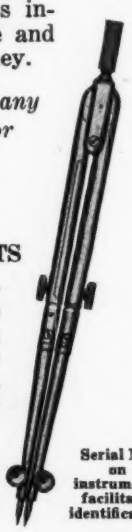
DUPLEX: This is an ideal drawing paper for school use, as it stands a maximum of erasures. A sharp ink line may be drawn after erasing time and again over the same spot! Less sheets are wasted, less discouragement for the student. Saves instructor's time and the school money.

Furnished in any sheet-size or in rolls.

"MINUSA" DRAWING INSTRUMENTS

American quantity production enables us to sell these high-grade instruments at a moderate price. *All parts are interchangeable and replaceable*—hence "Minusa" last almost indefinitely.

We also carry a large variety of lower-priced imported Drawing Instruments.



Serial No. on instruments facilitates identification

"POPULAR" DRAWING TABLE

A low priced, serviceable table, especially designed for the Mechanical Drafting class. Has tilting top and can be raised to 42 in. height.

Sizes from 23 x 31 in. to 36 x 60 in.

Shipped K.D. Prices include crating.

Have you a copy of our "Manual Training Catalogue"?

— LET US QUOTE ON YOUR REQUIREMENTS —

KEUFFEL & ESSER CO.

NEW YORK, 127 Fulton Street, General Office and Factories, HOBOKEN, N. J.

CHICAGO 203-209 S. Dearborn St. ST. LOUIS 817 Locust St. SAN FRANCISCO 83-84 Second St. MONTREAL 5 Notre Dame St. W.

Drawing Materials, Mathematical and Surveying Instruments, Measuring Tapes

BUYERS' NEWS

NEW TRADE PRODUCTS

New Combination Square Saw Jointer and Cutter Grinder. The New Huther Brothers Catalog No. 46, just issued shows a new device developed by the company for cutter grinding. The machine which is attachable to any light socket, can be used for jointing saws and cutters ranging from 3 to 22 inches in diameter.

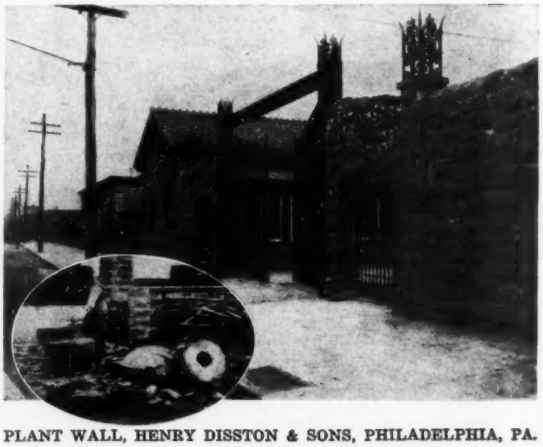
By merely changing the attachment, the machine can be used for grinding or sharpening inside dado cutters, giving them the proper clearance.

Information concerning the saw jointer and cutter grinder may be obtained by writing to the Huther Brothers, at Rochester, N. Y.

The Keeping Properties of Glue. The Henry Wilhelm Co., of Pittsburgh, Pa., has completed the first of a series of tests on the keeping properties of glue. The tests were made by a fully qualified independent research laboratory on samples of Bison Brand glue and an average grade of commercial glue. The keeping properties are determined entirely by the presence or absence of bacteria and the photomicrographs show what happens or does not happen after glue gets into the joint. The way to buy glue is by quality and the real value of it is determined by the three factors: Its keeping properties, its impurities, and its water absorption.

Information concerning glue and its keeping properties may be obtained by writing to the Wilhelm Company, at 134 Tenth St., Pittsburgh, Pa.

A Wall of Grindstones. Grindstones are an unusual material used in building a wall several blocks long around two sides of a 65-acre tract in Philadelphia, occupied by the plant of Henry Disston & Sons, Inc. Along a third side which fronts on the Delaware river, is a massive retaining wall, also constructed of grindstones.



PLANT WALL, HENRY DISSTON & SONS, PHILADELPHIA, PA.

The stones were worn out in grinding saws and other tools in the Disston plant, and more than 2,500 of them were utilized in building a church. No record was kept of the thousands which went into the retaining wall around the plant and the wall on the river front.

In addition to serving as walls, the grindstones are also used as foundation material for roads within the area occupied by the factory buildings that compose the Disston works.

TRADE PUBLICATIONS

Woodworking Equipment Catalog. Woodworking Equipment is the title of a fifteen page booklet, issued by the Little Giant Company, of Mankato, Minn., describing Little Giant Woodworking Lathes and Band Saws.

Since simplicity has been deemed especially desirable in vocational or manual training shops, Little Giant woodworking machines have been designed so that small boys may operate them as easily and as safely as grown men. The headstock lathe eliminates counter-shafting and belt-shifting and the band saw is controlled by a snap switch, well insulated and protected. The booklet describes and illustrates the headstock motor lathe, the belt and motor-driven band saws, and the general equipment for all kinds of models. All the woodworking equipment of the firm is manufactured with the idea of safety, accuracy, economy and utility in mind.

The booklet will be sent to any school official who addresses the Little Giant Company, at Mankato, Minn.

Job Sheets on Wood Finishing. The S. C. Johnson Co., of Racine, Wis., has issued a series of seven job sheets on wood finishing for the benefit of woodworking teachers in vocational shops and classes. The series of job sheets is very complete and covers the processes of staining, filling of cracks, varnishing, waxing and enameling.

(Concluded on Page 34a)

Art Fibre Weaving

Will help you overcome some of your manual training problems.

"Awkward hands," the bane of the manual arts teacher, can be quickly remedied through a course in Art-Fibre Furniture Weaving.

Teachers tell us this keenly interesting hand work offers just the right training to develop co-ordination of mind and muscle. It makes the hands strong and the fingers nimble and quick to carry out mental commands. Tests prove that students who have had furniture weaving experience become the best in the other manual training activities.

More than 100 furniture projects ranging from simple stands to complete suites of furniture are available. This assortment enables you and your classes to choose projects that will find a ready welcome in the student's own home.

WE SUPPLY ALL NECESSARY MATERIALS

Frames are shipped knocked-down, all stake and nail holes are properly bored and mortises fitted for quick and accurate assembling. All other weaving and finishing materials are supplied in the proper quantities complete at one price, or you may order in separate units.

New Revised Text Book Free With An Order of $10.00 or More

With this 164-page text book illustrating and describing more than 100 furniture projects and containing instructions for developing twenty-five beautiful duo-tone enamel finishes you can weave almost every conceivable piece of woven furniture. All weaves are clearly explained with progressive illustrations. It is the most complete book of its kind available.

YOU AND YOUR CLASSES WILL LIKE ART-FIBRE FURNITURE WEAVING.

LET US TELL YOU MORE ABOUT IT.

WRITE FOR FOLDER A.

GRAND RAPIDS FIBRE CORD COMPANY

Myrtle St. N. W. & P. M. Ry.

GRAND RAPIDS, MICH.

End Table No. 940.
Top 12" x 24". Height 23".

Everything for weaving and finishing including a high-grade veneer top and the K. D. frame. Varnish Finishes $3.40. Duo-tone Enamel Finishes $4.05.

Book Rack No. 976.
Length 27". Height 34".

Only $5.15 for all materials for weaving and finishing, including the frame (K. D.), in your choice of Walnut, Mahogany and Oak Finishes. Duo-tone Enamel Finishes $5.80.

THESE BOOKS TELL THE STORY

Book of Designs and Materials
1925-1926 Edition

A handsome and complete new volume (8" x 11") containing over a hundred photographic reproductions of available projects. These range from baskets and trays to chairs, davenports, settees, porch swings, desks, ferneries, lamps of all kinds, etc. This book also supplies complete information regarding amount and character of materials used in each project. The Book of Designs is supplied at the cost of postage and handling. 15 cents per copy, postpaid.

Text Book on Art-Fibre Weaving
Revised 1925-1926 Edition

This new, large text book explains the fundamental principles of weaving with progressive illustrations. More than 100 projects are worked out in detail. These instructions enable you to make all projects shown in the large new Book of Designs. This work contains 170 illustrations. The DE LUXE EDITION (as shown) is finely printed and has gold embossed cloth cover with super binding. De Luxe Edition. $1.25 per copy, postpaid. $1.37 if sent C. O. D.

PRACTICAL BOOKS

for courses in

Mechanical Drawing
Perspective Sketching
Shop Mathematics
Forging
Printing

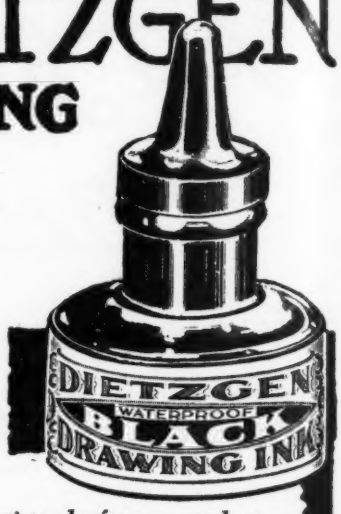
Edited by
FRANK E. MATHEWSON

10 days' approval

The Taylor-Holden Company
Springfield, Massachusetts

DIETZGEN DRAWING INKS

11 fast true brilliant colors



Preferred by artists, draftsmen, students everywhere

Flow Freely • Dry Quickly
Absolutely Waterproof

Purchase from your dealer or write our nearest branch

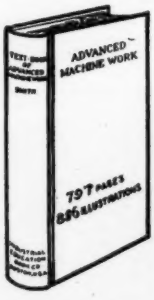
EUGENE DIETZGEN CO.
Enduring worth at reasonable cost

Chicago New York Philadelphia Washington
New Orleans Pittsburgh Milwaukee Los Angeles
San Francisco Factory at Chicago

Drawing, Surveying & Mathematical Instruments & Materials, Measuring Tapes

IN THE VANGUARD OF PROGRESS

ADVANCED MACHINE WORK



Seventh Edition, Revised and Enlarged.
By ROBERT H. SMITH
Massachusetts Institute of Technology

A BOOK that is needed in this AGE OF MACHINERY AND RAPID PRODUCTION. It solves the problem of teaching and learning machine work. IT CONTAINS 886 OF THE MOST INSTRUCTIVE ENGRAVINGS EVER PUBLISHED IN A BOOK OF THIS KIND.

IT IS USED in colleges, universities, technical, apprentice, automobile, and vocational schools, and machine shops.

MACHINE WORK gives a broad training and is the fundamental and necessary basis for positions in MODERN INDUSTRIES.

MEASURING WITH LIGHT RAYS: Practical instruction is given in this latest method of making mechanical measurements to the ten thousandth, hundred thousandth, and even to the millionth of an inch, which students, teachers, engineers, apprentices, machinists, and tool makers should learn.

Price $3.00. Packing and postage 25c.

INDUSTRIAL EDUCATION BOOK CO.
Box 153, Back Bay, BOSTON, U. S. A.

DAY SCHOOLS FOR YOUNG WORKERS

By
Franklin J. Keller, Ph. D.

"I think it is the most valuable book we have in Vocational Education," writes one state director of Vocational Education.

"Out of his training and experience he has given us one of the best books that has yet been published in this field," comments *The Vocationist.*

If you are interested in this phase of Vocational Education, you should read Dr. Keller's book.

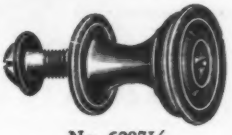
8 vo. 577 pages $2.60

THE CENTURY CO.
353 Fourth Avenue New York City

No. 4459
Drop Handle
Drawer Pull

For Manual Training Instructors

Our 350 Page Catalog Is Sent Gratis Upon Request
Be Sure to Give Us the Name of Your School.

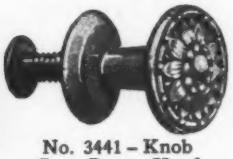


No. 6287¼
Solid Brass Knob
Machine Turned

No. 4471
Drop Ring Handle
Drawer Pull

All Illustrations Shown Here Are Actual Size Reproductions of Each Article

No. 449
Drop Ring Handle
Drawer Pull



No. 3441 – Knob
Cast Brass Head
With a
Sheet Brass Collar.

Our Catalog
Shows Many Styles

No. 383
Escutcheon

Our Line of Trimmings – Tools – Materials and Supplies for Use in the Manual Training Arts Is the Most Complete Line Carried for Immediate Demand.

Lussky, White & Coolidge, Inc.

COMPLETE EQUIPMENT FOR VOCATIONAL SCHOOLS

65 to 71 West Lake Street, Chicago, Ill.

No. 5473
Escutcheon

(Concluded from Page 32a)

The job sheets were prepared by experts and chemists, in collaboration with one of the woodfinishing instructors at Stout Institute, and they are furnished gratis, to any woodworking instructor who requests them.

Huther Saw Catalog Issued. The Huther Bros. Saw Mfg. Co., of Rochester, N. Y., has recently issued a 102-page booklet, describing and illustrating the various kinds of saws manufactured and put on the market by this firm.

The booklet illustrates circular, shingle or heading, grooving, edger, fiber cutting, jig, milling, band and sash saws, as well as matcher and lock corner box cutters. It also includes tables of sizes of saws, and of decimal equivalents and weight per square foot of crucible steel, together with price lists and other useful information. A copy of the booklet will be sent to any school shop instructor who requests it.

Issue New Crayons and Container. The Joseph Dixon Crucible Co., Jersey City, N. J., has just issued a new and beautiful crayon, under the trade name of "Prestlite". The Prestlite is a pressed crayon suitable for use in the grades in public schools, and is enclosed in a new and beautiful box.

School authorities who desire to investigate this new crayon may obtain samples by addressing the Dixon Company at Jersey City, N. J.

Industrial-Arts Cooperative Service for Teachers. Teachers of the industrial arts are frequently in need of directions for work they have never tried before, or of pictures and materials which they have been unable to obtain.

To provide a receiving and distributing center for this kind of service, the Industrial-Arts Cooperative Service has been established at 1256 Amsterdam Ave., New York City. It is a mutual aid organization which has been formed for the purpose of facilitating work in the field of elementary industrial arts. It is a member's service for members, and the organization has been built up as a result of the needs, ideas, and contributions of the membership at large. The organization holds a membership in the Cooperative League of America and is incorporated under the laws of the state of New York, having been approved by the state commissioner of education.

The organization sends out regular news letters, lists commodities which may be ordered by teachers, and also maintains a special service to answer calls for special help.

LAND GOES TO TRADE EXTENSION BUREAU

Mr. S. Lewis Land, formerly lecturer in vocational education at the University of Wisconsin, has resigned to accept a position as chief of the correspondence training division of the National Trade Extension Bureau, maintained by the employing plumbers' organization. He will have his headquarters at Evansville, Ind.

Mr. Land is a graduate of the East Tennessee Normal College, and of Peabody College. He was later graduated from the University of Wisconsin, with the degree of M. S., and also has done some advanced work leading to the degree of Ph.D. at the University.

S. LEWIS LAND,
Evansville, Ind.

He has served as teacher and supervisor of manual arts in Johnson City, Tenn., as a teacher and director of vocational work in the Tennessee Polytechnic Institute, and as lecturer for the Wisconsin University. He has done some survey work in the vocational field and possesses some practical experience as a furniture manufacturer and carpenter.

In his new position, Mr. Land will be responsible for the administration of the correspondence division of the Bureau, which has charge of the training of apprentice plumbers and steamfitters. He will devote a part of his time to the preparation of study manuals for courses in the plumbing and heating trades.

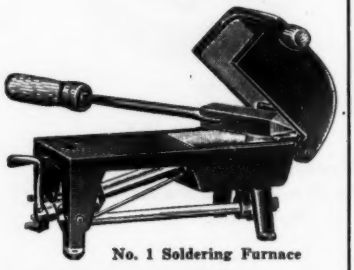
JOHNSON

GAS FURNACES

Do All Your Soldering
Heat-Treating
Metal-Melting
Without the
Use of a Blower!

No. 118 Combination Bench Furnace.

Johnson Furnaces produce more heat quicker, with less gas, due to the Johnson Patented Direct Jet Regulator.



No. 1 Soldering Furnace

Let us send you our complete descriptive catalog of Direct Jet Appliances.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

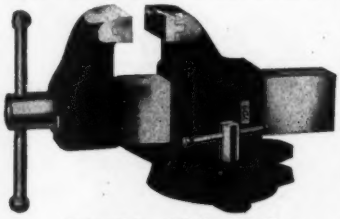
Pacific Coast Representative
C. B. Babcock Co. San Francisco, Calif.

TEACH THEM ON VISES
They Will Eventually Use

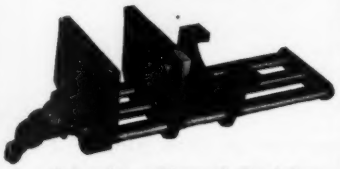
Columbian Vises on the Instructor's Bench give students an advantage when they leave school and take up their various trades.

When they go to work, they find familiar tools to work with — almost everywhere.

You can equip all departments of your school with Columbian Vises. There is a type and size for every purpose.



Columbian Malleable Iron Machinists' Vise.

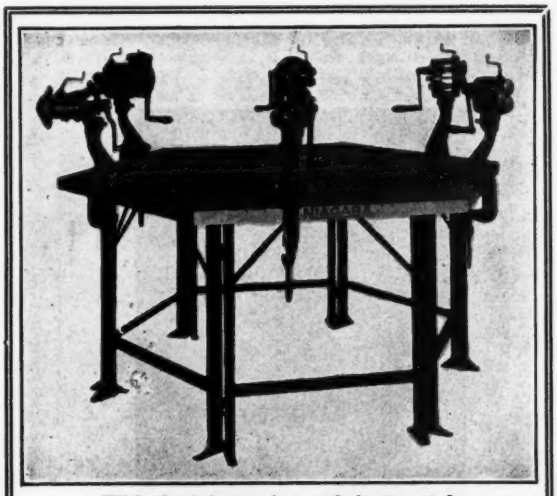


Columbian Manual Training Vises.

Literature gladly sent to instructors on request.

The Columbian Hardware Company
Cleveland, Ohio

COLUMBIAN



With the increased use of sheet metal comes an increased demand for efficient operators.

The Hexo Bench illustrated shows one typical installation for vocational schools. Circular No. 103 gives shop layouts and list of equipment for practical instruction in this trade. It should be in your files. Send for it today.

NIAGARA MACHINE & TOOL WORKS
Established 1879
637-697 NORTHLAND AVE., BUFFALO, N. Y., U. S. A.

NIAGARA

Overlook This

and you overlook one of the best courses for Manual Training Workshops

A large number of the foremost schools in the country (public and private) have come to realize this fact and are teaching ***Sheet Metal Working*** in their Manual Training Department. They realize sheet metal is rapidly taking the place of wood in most every industry and mechanics knowing this trade are in great demand.

The work is healthful, the hours short, and pay ranks high among the best paid trades.

The initial equipment required costs far less than any other equipment you could install considering the results obtained. The supplies necessary to carry on the course cost very little.

We will be glad to furnish an estimate on sufficient machines and tools to cover your needs upon receipt of number of pupils to be taught.

At least send for literature on the subject.

BERGER BROS. CO.
"EVERYTHING FOR THE TRADE"

229-231-233-235-237 Arch Street,
PHILADELPHIA.

PEXTO GUIDE No. 25A

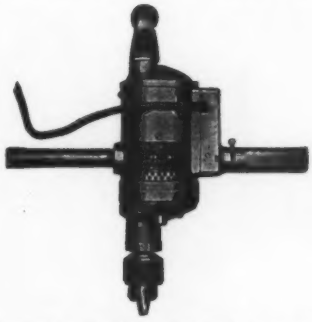
Free for the Asking—

SHEET METAL WORK—as an Industry—its Value as a timely Industrial Vocation for School Shops — the Projects — Aims of the Course — Sheet Metal Working Machinery — Application, and other things you would like to know are fully covered.

THE PECK, STOW & WILCOX CO.
Southington, Conn., U. S. A.

"CLARK"

Portable Drills



Clark Portable Drills are ideal for general purpose work in school shops and should be included as part of the regular equipment. A low speed is provided for big bits and with simple gear shift, speed is immediately doubled for smaller bits.

Handles are removable—gears grease encased—motors cooled by fan. High grade ball bearings used liberally—spindle and gears made of alloy steel, heat treated—shafts and spindles accurately ground.

Write for new No. 30 Catalog of "Clark" electrically driven tools.

JAS. CLARK, JR., ELECTRIC CO.
603 BERGMAN ST., LOUISVILLE, KY.
"CLARK" *Drills Do Cost More. But They're Worth It*

Marshalltown
THROATLESS SHEARS

Hand Power Belt or Motor

Marshalltown Throatless Shears will take sheets and plates of unlimited width and cut curves of small radius in any direction.
Made in several sizes with capacity up to and including ½-in. boiler plate.
We have a size and style to suit your work.
Write today for our catalog and prices. Dept. FS.
Marshalltown Manufacturing Co.
Marshalltown, Iowa

No cutting tool is better than its edge
Keep the tools sharp

No. 475

PLURALITY OILSTONE TOOL GRINDER

THE most convenient, serviceable and efficient tool sharpening machine ever made.

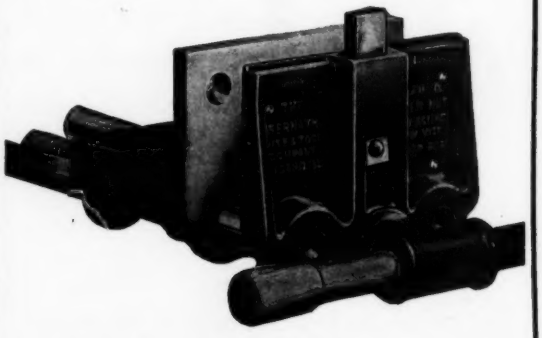
This new Tool Grinder has been carefully designed to combine many new advantages with the essential features of older models. It combines five basic units in one machine: *coarse oilstone wheel, fine oilstone wheel, grinding cone, leather stropping wheel, emery wheel,* and all accessible from two adjacent sides.

It is motor driven, ball bearing throughout, and every unit is thoroughly guarded.

Write for full descriptive bulletin.

MUMMERT-DIXON CO.
Hanover, Pa.
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

— ABERNATHY —
ROLLER NUT Rapid Acting VISES



give the most satisfactory service in school shops because of their Simplicity, Strength and Refinement of construction.

Write for a copy of our latest circular.

THE ABERNATHY VISE & TOOL COMPANY

2842 West 26th St. **CHICAGO, ILLINOIS**

1400 PAGES OF SHOP EQUIPMENT

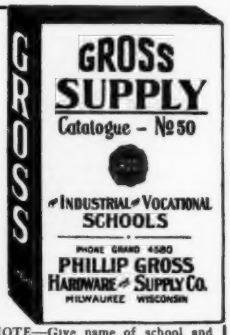
WRITE FOR YOUR COPY TODAY

Our experience in supplying schools with their *manual training equipment and supplies* for 56 years places us in a position to take care of your requirements promptly, intelligently, and at a *worth-while saving.*

Send us your order and let us prove to you that our service and quality of merchandise is really PREDOMINANT — and that our *prices will stand comparison.*

Direct Factory Representatives of nationally known and advertised brands.

"If it's from Gross it's good"



NOTE—Give name of school and position when requesting catalog.

PHILLIP GROSS HARDWARE & SUPPLY CO.

216-220 Third St., **Milwaukee, Wis.**

Teach with Type

PRINTING is a Practical Educator

Schools everywhere are installing printing equipment and using type-setting as the most effective way of teaching English and the related studies—design, mechanics and practical citizenship.

School papers issued by such departments quicken the spirit of the entire enrollment and faculty. At our Chicago factory we maintain an expert free service in selecting suitable outfits. For information and estimates adapted to the needs of your school, write to our

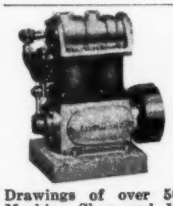
EDUCATIONAL DEPARTMENT

MONROE AND THROOP STREETS · CHICAGO, ILLINOIS

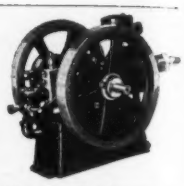
Barnhart Brothers & Spindler

FURNISHERS OF SUPERIOR PRINTING OUTFITS FOR SCHOOLS

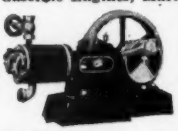
Chicago Washington, D.C. Dallas Omaha Seattle
Kansas City Saint Louis Saint Paul Vancouver, B.C.



CASTINGS AND BLUE PRINTS



MANUAL TRAINING AND VOCATIONAL SCHOOLS can get new Machine Shop Projects for Beginners. We supply Castings and also Detailed and Assembled Drawings of over 50 different Projects suitable for Beginners in Machine Shop and Vocational Training. We have Steam, Gas and Gasoline Engines, Marine Engines, Model Engines, Boilers, Lathes, Drill Presses, Grinders, Etc.



Our new No. 26 Catalogue, 128 Pages, Illustrated, sent FREE to MANUAL TRAINING AND VOCATIONAL SCHOOL INSTRUCTORS AND SUPERINTENDENTS. Write for it today

RE-ORGANIZED:

Modern Engine & Supply Co., Inc., 514 W. Van Buren St., Chicago, Ill.

No. 0 JUNIOR DRILL
Drills, Disc Grinders, Grinders, Universal Saws, Disc Sanders, All Motor Driven

WINTERHOFF PORTABLE MOTOR DRIVEN TOOLS

The new Winterhoff 10½" Bench Drill 0 to ⅜" Capacity is a highly efficient drill accurately made, equipped with ¼ H.P. motor, endless belt guarded, driven pulley has bearing at top and bottom, speeds 1100 and 3500, suitable for ⅜" drill and smaller.

Send for circular giving full description, or see your local dealer.

Price $55.00
F. O. B. Elkhart, Ind.

Winterhoff Tool & Machine Co.
No. 108 South Elkhart Ave.,
Elkhart, Ind., U. S. A.

TEACHERS

of

Geometry, Mechanical Drawing, Manual Arts

Assist your students in the visualization of orthographic drawings by quick and easy models from Permoplast Professional Wax, a permanently plastic material of a very firm texture suitable for both modeling and cutting.

Write for free sample.

AMERICAN ART CLAY COMPANY

353 W. 14th St., **INDIANAPOLIS, IND.**

APRONS = FOR THE MANUAL TRAINING SHOP

The boys need this protection. Parents appreciate it, and you will enjoy the added appearance of your class in uniform.

NOTE—Free Instructor's Apron with your order of 12 or more aprons. 45" in length, a dandy apron. Price without accompanying order for students, $1.10. See Below.

Used in Shops all over the country and for twelve years the standard protection for students in the school work room.

NOTE THESE FEATURES:

Adjustable Neck Strap — Large Roomy Pockets
Ample Size and Weight

Your choice of either brown duck or white.

Guaranteed to be exactly like illustration.

Our large stock of these aprons makes shipment same day a certainty and our reputation and quality of merchandise insures your complete satisfaction. Goods sent prepaid anywhere east of Denver.

Prices of White Aprons, each - - 80c
Prices of Brown Aprons, each - - 65c

Special Price on 100 Lot Orders. ***Send for Descriptive Booklet of Full Line.***

Remember this apron is a positive economy as it saves the clothing and repays many times its original cost.

CANVAS PRODUCTS CORP., FOND DU LAC, WIS.

TEACHERS

A BUREAU FOR SPECIALISTS — THE SPECIALISTS' EDUCATIONAL BUREAU — ODEON BLDG. ST. LOUIS, MO.

Make your training count. Get the best position to be had. Let us tell you of choice openings in just the locality desired. Highest salaries. Confidential service. No obligation to accept any place. Cincinnati, Rochester, Indianapolis, Atlanta, Des Moines, Omaha, St. Louis, and other leading cities have selected our candidates. Not an ordinary agency. Leading bureau for specialists. Write for details—NOW.

SPECIALISTS' EDUCATIONAL BUREAU

Odeon Bldg., St. Louis, Mo.

Largest Teacher Placement Work in the U. S.

Under One Management—Direction of E. E. Olp,
28 E. Jackson Blvd., Chicago.

Fisk Teachers Agency, **28 E. Jackson Blvd., Chicago.** Affiliated offices in principal cities.

American College Bureau, **Chicago Temple, Chicago.** College and university work only.

National Teachers Agency, **Southern Bldg., Washington.**

Education Service, **1254 Amsterdam Ave., New York; 19 So. La Salle St., Chicago.** Public school work a specialty. All forms of service to schools and teachers.

Our Service Is Nation Wide

ROCKY MT. TEACHERS' AGENCY

410 U. S. NATL. BANK BLDG. WILLIAM RUFFER PH. B. MGR. DENVER, COLO.

BRANCH OFFICES PORTLAND, ORE. MINNEAPOLIS, MINN. KANSAS CITY, MO.

Teachers Wanted

For Schools and Colleges ***Every day of the year***

NATIONAL TEACHERS' AGENCY, Inc.

D. H. Cook, Gen. Mgr. *Home Offices, Philadelphia, Pa.*

Branches:

Pittsburgh, Pa.; Indianapolis, Ind.; Syracuse, N. Y.; Northampton, Mass.

No charge to Employers—No charge to candidates until elected — Positions waiting for Art teachers.

ALBERT TEACHERS' AGENCY

34th Year
New York, 437 Fifth Avenue
Denver, Symes Building
Spokane, Peyton Building

25 E. Jackson Blvd., Chicago
Our booklet, "Teaching as a Business," with timely chapters on Peace Salaries, Industrial Arts Positions, etc., sent free.

ALBANY TEACHERS' AGENCY

Established 1885

Reliable Service for Reliable Teachers

Send for Bulletin
74 Chapel St., Albany, N. Y.

SOUTHERN TEACHERS' AGENCY

COLUMBIA, S. C.
CHATTANOOGA, TENN.
RICHMOND, VA.
LOUISVILLE, KY.

Continuous registration in four offices.

No advance fees.

Covers Middle Atlantic, South and Middle West.

Kennedy Utility Saw

Cuts any Angle

$65 complete with ¼ h.p. A.C. Motor and 7" saw

Will take from 6" to 10" Saws. Will do dado work

RALPH KENNEDY
111 No. 7th St.
Philadelphia

BALL BEARINGS Without Saw, Grinder and Motor $45

The sturdiest and most practical bench saw for instruction and general utility purposes. Its many exclusive features make it invaluable for the school shop.

The only cheap thing about the Kennedy Utility Saw is the price. Made throughout of the highest grades of iron and steel. Full descriptive literature sent on request.

Fancy Leathers

For Craft Workers

A 3-cent stamp brings you samples.
Sold by the half or whole skin and cut to measure. Send $1.00 P. O. order for variety of colors of leather remnants for home and school work.

Tools and Designs
Snap Fasteners to Match Leathers
Sphinx Paste

W. A. HALL, 250 Devonshire St., Boston 9, Mass.

BUILD YOUR OWN PHONOGRAPH

ANDREW CARNEGIE said to succeed, "Prepare to the utmost, then do the best you can," and preparation is the most important, since success naturally follows. A valuable means of preparation in good cabinet making and design is the building of a genuine

ARISTOCRATIC CHORALEON PHONOGRAPH

Plays any record with unsurpassed beauty and tonal volume. The entire school will enjoy it. Finest motors, tone arms and case materials, cut to fit, with complete instructions, at SMALL COST. Write for FREE blue print offer.

CHORALEON PHONOGRAPH & RADIO CO.
136 6th ST. ELKHART, IND.

THE ORIGINAL AND GENUINE EXTENSION LIP AUGER BITS

ARE STAMPED

RUSSELL JENNINGS

on the round of each bit.

THE RUSSELL JENNINGS MFG. CO.

CHESTER, CONN., U. S. A.

ANOTHER "FABER" BOOK

A TREATISE ON DIMENSIONING

By JOHN F. FABER,
Instructor of Mechanical Drafting,
Academy High School, Erie, Penna.

A beginner's course in dimensioning for students of mechanical drawing. Consists of a series of ninety-one problems which cover in an elementary manner dimensioning in simple machine and woodworking drawings. Exercises progressive in difficulty, each supplemented with clear instructions and illustrations.

The author covers completely such problems as: Plain Rectangular Objects, Detail and Overall Dimensions, Rectangular Holes, Cylindrical Objects, Arcs or Parts of Circles, etc.

Paper, 64 pages; 6¾ x 10¼" **Price, $.68, Net.**

OTHER "FABER" BOOKS

MECHANICAL DRAWING PROBLEMS

Contains a group of drafting room problems in blue print form, selected from thoroughly tested work. The projects are arranged in groups according to a definite teaching order, which can be followed if desired. The problems are selected from practical shop projects.

Cloth, 224 pages **Price, $2.50, Net.**

LETTERING EXERCISE MANUAL

Inclined Gothic Letters
Vertical Gothic Letters
Simple Architectural Letters

These three exercise manuals with carefully planned and clearly defined processes coming through the alphabet and figures for capital letters to lower case. Horizontal and vertical guides printed in color tint.

Prepared by Mr. Faber and Mr. Jonathan Bright, Instructor of Drafting, Academy High School, Erie, Penna.

Paper covered, 64 pages in each book **Price, $.56, per book.**

THE BRUCE PUBLISHING COMPANY
203 Montgomery Building **Milwaukee, Wisconsin.**

DIRECTORY OF EQUIPMENT AND SUPPLIES

ANVILS
Atkins & Company, Inc., E. C.
Disston & Sons, Henry
Fisher & Norris
APRONS
Canvas Products Company
BENCH LATHES
Ames Company, B. C.
Wallace & Company, J. D.
BITS
Cleveland Twist Drill Co., The
Greenfield Tap & Die Corp.
BITS AND BRACES
Atkins & Company, Inc., E. C.
Jennings Mfg. Co., Russell
Stanley Works, The
BLACKSMITH TOOLS
Buffalo Forge Company
Stanley Works, The
BLUEPRINTS
Modern Engine & Supply Company
BLUEPRINT FILING CASES
Dietzgen Co., Eugene
Keuffel & Esser
Pease Company, C. F.
BLUEPRINT PAPER
Keuffel & Esser
Pease Company, The C. F.
BOOKS
McGraw-Hill Book Company
Taylor-Holden Company
Van Nostrand Company, D.
BOOKBINDING SUPPLIES
Bradley Co., Milton
CALIPERS
Starrett Company, The L. S.
CHISELS
Disston & Sons, Inc., Henry
Rauch & Company, F. A.
Stanley Works, The
CLAMPS
Adjustable Clamp Co.
Atkins & Company, Inc., E. C.
Christiansen, C.
Crescent Machine Company, The
Disston & Sons, Henry
Gross Hardware & Supply Co., Philip
Hartford Clamp Company
Rauch & Company, F. A.
Starrett Co., The L. S.
CLUTCHES—FRICTION
Johnson Machine Co., The Carlyle
COPING SAWS AND BLADES
Disston & Sons, Henry
COUNTERBORES
Cleveland Twist Drill Co., The
COUNTERSINKS
Cleveland Twist Drill Co., The
Greenfield Tap & Die Corp.
CRAYONS
American Crayon Company
Binney & Smith Co.
Bradley Co., Milton
Dixon Crucible Co., Joseph
Weber Company, F.
DOMESTIC SCIENCE EQUIP. & SUP.
Rohne Electric Company
DRAFTING FURNITURE AND SUP.
Bradley Co., Milton
Christiansen, C.
Dietzgen Co., Eugene
Englewood Top & Panel Co.
Keuffel & Esser
Pease Company, The C. F.
U. S. Blue Company
Weber Company, F.
DRAWING INSTRUMENTS
Bradley Co., Milton
Dietzgen Co., Eugene
Pease Company, C. F.
Keuffel & Esser
Post Company, The Frederick
U. S. Blue Company
DRAWING MATERIALS
Devoe & Raynolds Co.
Keuffel & Esser
DRAWING PAPERS
Bradley Company, Milton
Dietzgen Company, Eugene
Keuffel & Esser
Pease Company, C. F.
Post Company, The Frederick
U. S. Blue Company
DRILLS AND DRILL PRESSES
Buffalo Forge Company
Cleveland Twist Drill Company
Greenfield Tap & Die Corp.
Jennings Mfg. Co., Russell
Millers Falls Company
Silver Mfg. Company, The
Winterhoff Tool & Machine Co.
ELECTRICALLY DRIVEN TOOLS
Clark, Jr., Electric Co., Inc., Jas.
Heston & Anderson
ELECTRIC GLUE POTS
Francis Co., Chas. E.
ELECTRICAL SUPPLIES
Clark, Jr., Electric Co., Inc., Jas.
Rohne Electric Company
END MILLS
Cleveland Twist Drill Co., The
EXHAUST FANS
Buffalo Forge Company
Oliver Machinery Co.
FIBRE CORD
Grand Rapids Fibre Cord Co.
FILLERS
Johnson & Son, S. C.
FLASKS
Oliver Machinery Co.
FORGES
Buffalo Forge Company
Oliver Machinery Co.
FURNITURE FRAMES
Grand Rapids Fibre Cord Co.
Rauch & Company, F. A.
GAUGES
Atkins & Company, Inc., E. C.
Disston & Sons, Inc., Henry
Stanley Works
Starrett Company, The L. S.
GLUE
Higgins & Company, Charles M.
Rauch & Company, F. A.
Sure Grip Adhesives, Inc.
Wilhelm Company, Henry
GLUE HEATERS
Hall & Brown Woodworking Mach. Co.
Oliver Machinery Co.
Rauch & Company, F. A.
Rohne Electric Company
Wallace & Co., J. D.
GRINDERS
Cleveland Stone Company
Crescent Machine Company, The
Efficiency Grinder Company
Gallmeyer & Livingston Co.
Greenfield Tap & Die Corp.
Luther Grinder Mfg. Company
Mummert-Dixon Co.
Oliver Machinery Co.
HACKSAWS AND BLADES
Atkins & Company, E. C.
Disston & Sons, Inc., Henry
Millers Falls Company
Racine Tool & Machine Co.
Rauch & Company, F. A.
Simonds Saw & Steel Co.
Starrett Company, The L. S.
HAMMERS
Atkins & Company, Inc., E. C.
Maydole Hammer Co., David
Rauch & Company, F. A.
Stanley Works
HAND SCREWS
Adjustable Clamp Company
Christiansen, C.
Rauch & Company, F. A.
INKS—DRAFTING
Devoe & Raynolds Company
Dietzgen Co., Eugene
Higgins & Company, Charles M.
Keuffel & Esser
Pease Company, C. F.
Post Company, The Frederick
U. S. Blue Company
Weber Company, F.
INKS—PRINTING
Barnhart Bros. & Spindler
JOINTERS
Crescent Machine Company, The
Gallmeyer & Livingston Company
Hall & Brown Woodworking Mach. Co.
Heston & Anderson
Oliver Machinery Co.
Silver Mfg. Company, The
Wallace & Co., J. D.
LATHES—METAL WORKING
Little Giant Company
Monarch Machine Tool Company
Oliver Machinery Co.
Seneca Falls Machine Company
South Bend Lathe Works
Steptoe Co., The John
LATHES—WOODWORKING
American Saw Mill Machinery Co.
Greenfield Tap & Die Corporation
Hall & Brown Woodworking Mach. Co.
Little Giant Company
Oliver Machinery Company
Sebastian Lathe Company
Seneca Falls Machine Company
Sidney Machine Tool Company
Wallace & Company, J. D.
LEATHER
Hall, W. A.
Rauch & Company, F. A.
LEVELS
Disston & Sons, Henry
Millers Falls Company
Stanley Works
Starrett Company, The L. S.
LUMBER
(See Lumber Dealers' Directory)
Algoma Panel Company
American Walnut Mfrs. Ass'n
Englewood Top & Panel Co.
MACHINE KNIVES
Atkins & Company, E. C.
Crescent Machine Company, The
Disston & Sons, Inc., Henry
Hall & Brown Wdwkg. Mach. Co.
Oliver Machinery Co.
Simonds Saw & Steel Co.
MACHINE PARTS
Modern Engine & Supply Company
MANDRELS
Cleveland Twist Drill Co., The
Greenfield Tap & Die Corp.
MANUAL TRAINING BENCHES
Christiansen, C.
Gross Hardware & Supply Co., Philip
Oliver Machinery Company
Rauch & Company, F. A.
MECHANICS' HAND TOOLS
Atkins & Company, Inc., E. C.
Disston & Sons, Inc., Henry
Gross Hardware & Supply Co., Philip
Peck, Stow & Wilcox Company
Rauch & Company, F. A.
Stanley Works, The
Starrett Company, The L. S.
METAL WORKERS' TOOLS
Berger Bros. Co.
Disston & Sons, Inc., Henry
Johnson Gas Appliance Company
Niagara Machine & Tool Works
Peck, Stow & Wilcox Company
Racine Tool & Machine Co.
Starrett Company, The L. S.
MILLING MACHINES
Gallmeyer & Livingston Co.
Steptoe Co., John
MITRE BOXES
Atkins & Company, Inc., E. C.
Millers Falls Company
Stanley Works
Tannewitz Works, The
MODELING CLAY
American Art Clay Company
Bradley Company, Milton
Devoe & Raynolds Co.
Hammett Company, J. L.
PAPER CUTTERS
Chandler & Price Company, The
Weber Co., F.
PASTE
American Crayon Company
Bradley Company, Milton
Weber Company, F.
PENCILS
Dixon Crucible Co., Joseph
Weber Company, F.
PLANES
Rauch & Company, F. A.
Stanley Works
PLANERS
Ohio Machine Tool Co., The
Wallace & Company, J. D.
POWER HAMMERS
Little Giant Co.
PREPARED WAX
Johnson & Son, S. C.
PRINTING PRESSES
Chandler & Price Company, The
Miehle Printing Press & Mfg. Co.
PRINTING SUPPLIES
Barnhart Bros. & Spindler
Empire Type Foundry Co.
PUNCHES
Niagara Machine & Tool Works
REAMERS
Greenfield Tap & Die Corp.
REAMERS—Carbon and High Speed
Cleveland Twist Drill Co., The
RULES
Dietzgen Co., Eugene
Keuffel & Esser
Pease Company, C. F.
Rauch & Company, F. A.
Stanley Works
Starrett Company, The L. S.
Weber Company, F.
SANDERS
Oliver Machinery Co.
Wallace & Company, J. D.
SAWS
American Saw Mill Machinery Co.
Atkins & Company, E. C.
Crescent Machine Company, The
Disston & Sons, Inc., Henry
Gallmeyer & Livingston Co.
Hall & Brown Woodworking Mach. Co.
Heston & Anderson
Hunter Bros. Saw Mfg. Co.
Kennedy, Ralph
Millers Falls Company
Oliver Machinery Company
Racine Tool & Machine Co.
Rauch & Company, F. A.
Silver Mfg. Company, The
Simonds Saw & Steel Co.
Starrett Co., The L. S.
Tannewitz Works, The
Wallace & Co., J. D.
SAW BENCHES
American Saw Mill Machinery Co.
Gallmeyer & Livingston Company
Hall & Brown Woodworking Mach. Co.
Heston & Anderson
Oliver Machinery Co.
Shimy Machine Tool Company
Tannewitz Works, The
Wallace & Co., J. D.
SCREW DRIVERS
Disston & Sons, Henry
Jennings Mfg. Co., Russell
Millers Falls Company
Rauch & Company, F. A.
Stanley Works, The
Starrett Company, The L. S.
SCREW EXTRACTORS
Cleveland Twist Drill Co., The
Rauch & Company, F. A.
SCREW PLATES
Greenfield Tap & Die Corp.
SEWING TABLES
Christiansen, C.
SHAPERS—METAL WORKING
Carter Company, R. L.
Ohio Machine Tool Co.
Steptoe Co., John
SHEARS
Niagara Machine & Tool Works
Rauch & Company, F. A.
SHEET METAL TOOLS & MACHINERY
Berger Bros. Co.
Johnson Gas Appliance Company
Niagara Machine & Tool Works
Peck, Stow & Wilcox Company
SQUARES
Disston & Sons, Inc., Henry
Rauch & Company, F. A.
Stanley Works
Starrett Company, The L. S.
STAINS
Johnson & Son, S. C.
Rauch & Company, F. A.
THROATLESS SHEARS
Marshalltown Mfg. Company
TINSMITH'S TOOLS
Berger Bros. Co.
Niagara Machine & Tool Works
Rohne Electric Company
TOOLS
Atkins & Company, Inc., E. C.
Disston & Sons, Inc., Henry
Greenfield Tap & Die Corp.
Gross Hardware & Supply Co., Philip
Millers Falls Company
Rauch & Company, F. A.
Rohne Electric Company
Stanley Works, The
Starrett Company, The L. S.
TOOL GRINDERS
Atkins & Company, Inc., E. C.
Gallmeyer & Livingston Co.
Greenfield Tap & Die Corp.
Luther Grinder Mfg. Company
Mummert-Dixon Co.
Oliver Machinery Co.
TWIST DRILLS
Greenfield Tap & Die Corp.
TWIST DRILLS—Carbon and High Speed
Cleveland Twist Drill Co., The
TYPE
Barnhart Bros. & Spindler
Empire Type Foundry Co.
UPHOLSTERING SUPPLIES
Lussky, White & Coolidge, Inc.
Rauch & Co., F. A.
Rohne Electric Company
Thurston Manual Training Supply Co.
VARNISHES
Grand Rapids Fibre Cord Co.
Johnson & Son, S. C.
Rauch & Company, F. A.
VISES
Fisher & Norris
Luther Grinder Mfg. Company
Millers Falls Company
Morgan Vise Company
Stanley Works, The
VISES—WOODWORKERS'
Abernathy Vise & Tool Co.
Christiansen, C.
Oliver Machinery Company
WATER COLORS
American Crayon Company
Binney & Smith Co.
Bradley Company, Milton
Devoe & Raynolds Co.
Weber Company, F.
WAX CRAYONS
American Crayon Company
Binney & Smith Co.
Bradley Company, Milton
Dixon Crucible Co., Joseph
Weber Company, F.
WEAVING MATERIALS
Englewood Top & Panel Co.
Grand Rapids Fibre Cord Co.
Thurston Manual Training Supply Co.
WOODWORKING MACHINERY
American Saw Mill Machinery Co.
Boice, William B. & John E.
Buffalo Forge Company
Crescent Machine Company, The
Gallmeyer & Livingston Company
Greenfield Tap & Die Corp.
Hall & Brown Woodworking Mach. Co.
Heston & Anderson
Oliver Machinery Co.
Seneca Falls Machine Company
Sidney Machine Tool Company
Silver Mfg. Company, The
Steptoe Company, John
Tannewitz Works, The
Wallace & Co., J. D.
Yates-American Machine Co.
WRENCHES
Greenfield Tap & Die Corp

ADVERTISERS REFERENCE INDEX

Abernathy Vise & Tool Company....38a
Adjustable Clamp Company....4a
Algoma Panel Company....12a
American Art Clay Company....38a
American Crayon Company....31a
American Saw Mill Machinery Co....2a
Atkins & Company, E. C....2nd Cover
Barnhart Bros. & Spindler....38a
Berger Brothers Company....36a
Binney & Smith Company....16a
Bradley Company, Milton....1*a
Buffalo Forge Company....9a
Canvas Products Company....38a
Century Company, The....34a
Chandler & Price Co., The....3rd Cover
Choraleon Phonograph & Radio Co....39a
Christiansen, C....10a
Clark, Jr., Electric Co., Jas....37a
Cleveland Twist Drill Company....24a
Columbian Hardware Company, The....36a
Crescent Machine Co., The....11a
Devoe & Raynolds Co....15a
Dietzgen Co., Eugene....34a
Disston & Sons, Henry....3a
Dixon Crucible Co., Jos....42a
Efficiency Grinder Co....9a
Englewood Top & Panel Company....12a
Fisher & Norris....9a
Gallmeyer & Livingston Co....2a
Grand Rapids Fibre Cord Co....33a
Greenfield Tap & Die Corp....8a
Gross Hdwe. & Supply Co., Ph....38a
Hall, W. A....39a
Hall & Brown Wdwkg. Machinery Co. 2a
Hartford Clamp Company....10a
Heston & Anderson....6a
Higgins & Company, Charles M....13a
Huther Bros. Saw Mfg. Co....6a
Industrial Education Book Co....34a
Jennings Mfg. Co., Russell....39a
Johnson Machine Co., Carlyle....39a
Johnson & Son, S. C....1a
Johnson Gas Appliance Co....36a
Kennedy, Ralph....39a
Keuffel & Esser....32a
Little Giant Company....31a
Lussky, White & Coolidge, Inc....35a
Luther Grinder Mfg. Co....26a
McGraw-Hill Book Co....13a
Marshalltown Mfg. Company....37a
Maydole Hammer Co., David....36a
Miehle Prtg. Press & Mfg. Co..4th Cover
Modern Engine & Supply Co....38a
Monarch Machine Tool Company....21a
Morgan Vise Company....12a
Mummert-Dixon Company....37a
Niagara Machine & Tool Works....36a
North Brothers Mfg. Company....22a
Ohio Machine Tool Co., The....8a
Oliver Machinery Company....5a
Pease Company, The C. F....13a
Peck, Stow & Wilcox Company....37a
Post Company, Frederick....16a
Rohne Electric Company....11a
Sebastian Lathe Company....8a
Seneca Falls Machine Co....20a
Sidney Machine Tool Company....7a
Silver Mfg. Company, The....6a
Simonds Saw & Steel Co....23a
South Bend Lathe Works....18a
Stanley Works, The....27a
Starrett Company, L. S....26a
Steptoe Company, John....8a
Sure-Grip Adhesives, Inc....16a
Tannewitz Works, The....4a
Taylor-Holden Company....34a
Thurston Manual Training Supply Co..10a
Wallace & Company, J. D....11a
Weber Company, F....30a
Wilhelm Company, Henry....38a
Winterhoff Tool & Machine Co....38a
Yates-American Machine Co....35a

For articles which cannot be found in the above list address: Subscribers' Free Service Department, Industrial-Arts Magazine, Milwaukee, Wis.

The ELDORADO PAGE

Sketching with "the master drawing pencil"

SOME EXERCISES FOR YOUR H OR 2H ELDORADO

first Sharpen your pencil so it will make broad strokes

then Insist that it does make broad strokes

next Cover an area with tone like this

Some strokes vertical
Some horizontal

now Turn pencil over so the sharp edge will make fine black lines

and touch in some dark accented lines to indicate stone joints

HB to B used for bush and grass.

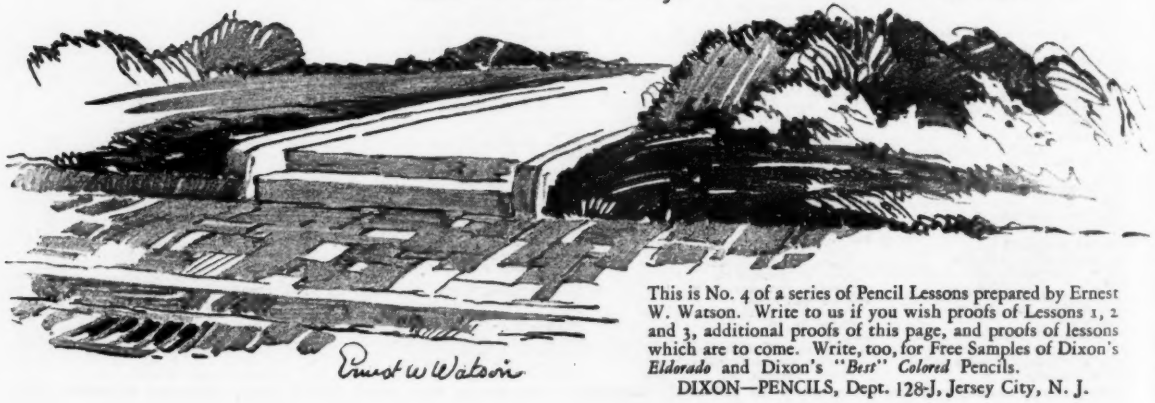
Result A random laid wall.

FOR A REGULARLY LAID STONE WALL

The individual stones must be considered

But avoid monotony of too much detail by massing strokes occasionally. thus

A vine makes a pleasing break in a long wall.



Ernest W Watson

This is No. 4 of a series of Pencil Lessons prepared by Ernest W. Watson. Write to us if you wish proofs of Lessons 1, 2 and 3, additional proofs of this page, and proofs of lessons which are to come. Write, too, for Free Samples of Dixon's *Eldorado* and Dixon's "*Best*" *Colored* Pencils.

DIXON—PENCILS, Dept. 128-J, Jersey City, N. J.

A Course Built Upon Educational Principles

The school print shop is rapidly growing in favor everywhere. Educators recognize the fact that printing courses fit perfectly into today's trend for the easier and faster assimilation of knowledge.

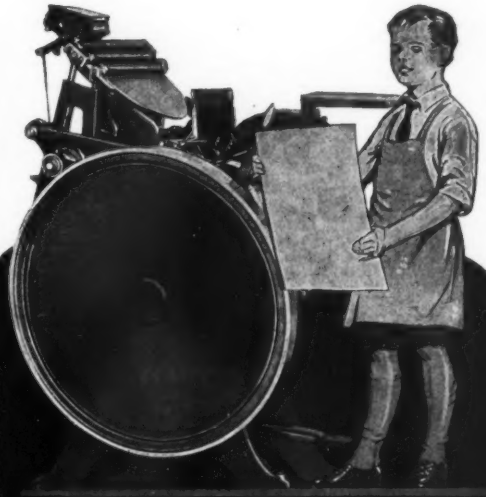
The pupil strengthens his knowledge of grammar and spelling, he learns speed with accuracy, as he willingly sets type, reads proofs, and operates the press.

Chandler and Price presses equipped with safety guards, are the choice of instructors and superintendents in most of the leading schools. They are quickly mastered because easy to operate. The pupil appreciates the additional fact that he is working on machines used in commercial print shops the world over.

The Chandler & Price Co., Cleveland, Ohio, U. S. A.

Safety Features

The gear guard completely covers the gear and pinion. The flywheel guard makes the revolving wheel safe. The platen guard prevents the student's hand from getting caught as the press prints.



The Chandler & Price Cutter

Easy to operate, accurate, and simple, the Chandler & Price Cutter is essential in school print shops. Hand or power operated.

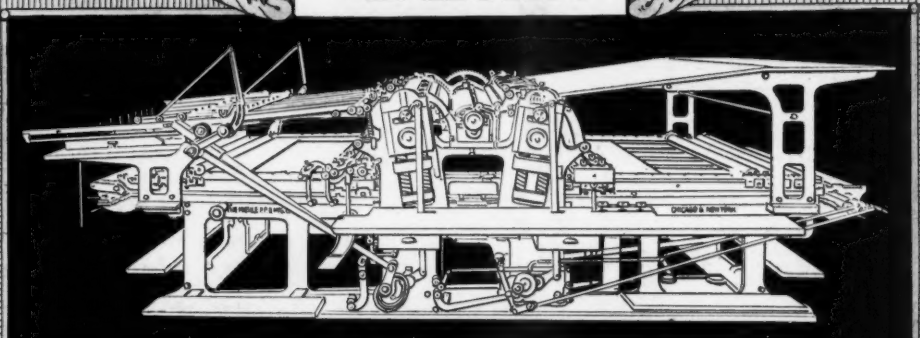
CONTACT WITH ART AND LITERATURE

ACCURACY SPELLING

GRAMMAR A PRACTICAL TRADE SPEED

Chandler & Price

The Miehle



The Miehle Two Color Press

TWO COLORS AT ONE IMPRESSION

THE Miehle Two-Color press saves labor, saves material and cuts waste to a minimum.

It is built in a variety of sizes, sufficient to cover every legitimate need for a press of this character.

It has every quality of the regular Miehle one-color, and many others all its own.

MIEHLE PRINTING PRESS & MFG. CO.

Main Office and Factory Fourteenth and Robey Streets, Chicago

Operating Exhibits: Transportation Building, Chicago Printing Crafts Building, New York

Sales Offices:

PHILADELPHIA BOSTON DALLAS SAN FRANCISCO LOS ANGELES ATLANTA, Dodson Printers' Supply Co.
OKLAHOMA CITY, Western Newspaper Union SALT LAKE CITY, Western Newspaper Union

YOU NEVER HEARD OF A MIEHLE BEING SCRAPPED